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THIRTY-SIXTH ANNUAL REPORT

ON THE

NEW YORK STATE MUSEUM OF NATURAL HISTORY,

BY THE

REGENTS OF THE UNIVERSITY

OF THE

STATE OF NEW YORK.

TRANSMITTED TO THE LEGISLATURE JANUARY 12, 1883.

ALBANY:
WEED, PARSONS & COMPANY.
1883.

a9 16/8
6/plts

STATE OF NEW YORK.

No. 53.

IN SENATE.

JANUARY 12, 1883.

THIRTY-SIXTH ANNUAL REPORT

OF THE TRUSTEES OF THE STATE MUSEUM OF NATURAL HISTORY.

UNIVERSITY OF THE STATE OF NEW YORK,
OFFICE OF THE REGENTS, TRUSTEES OF THE STATE
MUSEUM OF NATURAL HISTORY,
ALBANY, *January* 12, 1883.

To the Legislature :

I have the honor to transmit the Thirty-sixth Annual Report of the Trustees of the State Museum of Natural History, as required by law.

H. R. PIERSON,
Chancellor of the University.

CONTENTS.

PAGE.
Report of the Director.. 9–15
Additions to the collections of the State Museum during the year 1882.. 17–20
Appendix A. List of Niagara Fossils, from Waldron, Indiana, prepared and and arranged for the collections of the State Museum 21–25
Appendix B. List of genera and species of Brachiopoda, of which sections have been prepared for the microscope...... 26
Report of the Botanist, CHARLES H. PECK. 29–49
Some abnormal Forms of Fresh-Water Shells from the vicinity of Albany, N. Y. By CHARLES E. BEECHER............. 51–55
Bryozoa (Fenestellidæ) of the Hamilton group. By JAMES HALL... 57–72
On the Structure of the Shell in the Genus Orthis. By JAMES HALL.. 73–75
Description of Stylonurus Excelsior. By JAMES HALL...... 76–77
List of Species of Fossils from an exposure of the Utica Slate and Associated Rocks within the limits of the city of Albany. By C. E. BEECHER..................................... 78
A Catalogue of the Published Works of James Hall, LL. D., 1836–82. Communicated by Dr. DAVID MURRAY........ 79–94

REPORT.

To the Honorable the Legislature of the State of New York:

The Regents of the University, as Trustees of the State Museum of Natural History, in accordance with the provisions of law, respectfully submit their Thirty-sixth Annual Report.

For a full account of the operations of the Museum for the past year the Trustees beg to refer to the reports of the Director and the State Botanist, which are herewith transmitted.

Owing to the crowded condition of the Museum building the increase of the collections has been made a secondary matter during the past year. The labors of the assistants have been chiefly expended in preparing specimens for exhibition, and in other ways giving to the collections their greatest scientific value.

Whenever the State shall provide the much-needed additional room a great expansion in the number and variety of the specimens can at once be made.

More than 50,000 specimens belonging to the State now in charge of the State Geologist only await space to be transferred to the State Museum. The want of a fire-proof receptacle for these vast and invaluable collections is each year more plainly felt by the Trustees. During the last year one of the largest and most valuable collections in natural history in the country, that of Amherst College, was totally destroyed by fire, owing to the want of a fire-proof building.

The work of the scientific staff in the Museum has been prosecuted with great assiduity and success during the past year. The scientific papers of the members of the staff which have been published in the annual reports of the Legislature have been of great interest to scientific men, and applications for them are received from all parts of the world. It is earnestly recommended that the means to continue these publications may be afforded. In past years there has been much irregularity in the publication of the reports and much disappointment in consequence has been occasioned. There would be a great advantage in a plan by which the scientific reports of the Museum could be printed under the direction of the Museum staff, instead of forming a part of the public printing. But as this would entail a considerable additional expense to the Museum it could only be done by an increase of the annual appropriation for its support.

The work of distributing collections of minerals among the academies of the State, under the authority of a concurrent resolution of the Legislature, has been carried out as fully as seemed to be called for. It has been the policy of the Trustees to give these collections only in cases where there was encouragement to believe that they would be a welcome and a useful addition to the educational equipments of the institution. The Trustees earnestly desire to see the Museum become a great center of educational influence for the State. With this view they seek to devise ways for aiding teachers of science in the institutions of learning throughout the State. They would gladly see the Museum used by them for study, and the staff of the Museum employed in aiding these students in fitting themselves for science teachers.

Respectfully submitted,

H. R. PIERSON,
Chancellor of the University.

DAVID MURRAY,
Secretary.

REPORT OF THE DIRECTOR.

ALBANY, *December* 23, 1882.

To the Honorable the Board of Regents of the University of the State of New York:

GENTLEMEN — I have the honor to communicate herewith the Annual Report upon the State Museum of Natural History, with some general account of the condition of the collections in the several departments, the additions which have been made thereto, and the work done in the institution during the past year.

The collections of the State Museum are all in good order and condition; and, so far as our facilities permit, are arranged for exhibition to the public. It is, however, impossible to extend these facilities very greatly for want of space in the building. Some additional table cases have been added during the past year, taking the place of a small working-room which had been separated from one of the public halls.

During the past month the collections of birds, mammals and skeletons have been removed and carefully cleaned and examined, and replaced in their cases in good order. That portion of the ethnological collection upon the same floor has likewise received careful attention and the perishable portions have been treated in the same manner as the stuffed skins of birds, etc., in order to insure their preservation.

All the alcoholic collections have likewise been examined and put in proper order. The small collections of Radiates and Echinoderms have been examined and rearranged in the cases, with additional specimens of corals obtained during the past year. The work of dusting and cleaning the conchological collection is now in progress, and this will be followed by the cleaning and rearrangement of the mineralogical collection.

It has been impossible to accomplish the proposed plan of presenting a systematic catalogue of the birds and mammals of the State, as intended; this work is, however, only deferred to a more favorable opportunity.

A catalogue of the Unionidæ of the several collections in the State

Museum was presented with the thirty-third report, but this is not yet printed. A catalogue of the land shells of the New York State collection, and of the land shells of the United States, in the State Museum, also of the Corbiculidæ of the New York State collections, were communicated at the same time, together with other important papers, which still remain in the hands of the State printer. It is already well known to your honorable board (though perhaps not so well known to the general public) that copies of these reports, beyond the usual document edition, are printed only by special order of the Legislature; and as no resolutions to this effect were passed for the printing of the thirty-second and thirty-third reports, they were, consequently, only published among the legislative documents. The same conditions have prevented the proper publication of the thirty-fourth report.

In consequence of this state of affairs, the appendices in part, and most of the scientific papers have been withdrawn, and were communicated with the thirty-fifth report. Two papers have been published in full or in abstract, through other channels. The thirty-fifth report is now in the hands of the State printer, and some progress has been made in the work.

This condition of the printing renders the working of the Museum extremely inconvenient and unsatisfactory; while it is very discouraging to all connected with the institution to have no printed evidence of work done during several preceding years. Another serious cause of delay and hindrance in every department of the work of the Museum is the unsettled and uncertain tenure by which we hold and occupy our working rooms. With the return of each successive Legislature the permanency of any existing plans or arrangement is threatened, and consequently it is impossible to carry out any systematic disposition of the material preparatory to working, or any final arrangement of that which has been studied and published, and which has become a part of the permanent collection of the Museum. Not only does this uncertainty hinder the progress of work, but often renders it necessary to do over again work which has been done in a temporary or tentative manner. The evil arising from all this is greater than can be expressed, and the final influences must reach beyond the present, for each succeeding year renders it more and more difficult to bring up the unfinished work of the past. It affects not only the actual collections, it affects every thing connected with the working of the institution, and modifies every report and its appended scientific papers. It affects in a greater or less degree every one connected with the work. There is a consciousness that the conditions which exist are unfavorable; and we cannot avoid the belief that a portion of the intelligent public appreciate this state of affairs, and see the unfortunate influence on the results of the Museum work.

The additions to the Museum collections during the year 1882 will be found recorded in detail in the lists appended.

In the Botanical Department there have been nineteen contributors of an aggregate of 285 species.

In the Zoölogical Department there have been added to the arranged collections specimens from six sources.

The whale skeleton, purchased nearly two years since, has been in the custody of Professor Ward, of Rochester, for maceration and preparation. We had expected to have it delivered at the Museum about the end of this year, but I am just now informed that it will not be ready before March next.

The Museum Library has received the addition of 103 books and pamphlets by donation, and thirty publications by purchase and exchange.

To the collections in mineralogy, geology and palæontology, there have been added by donations from eleven contributors 72 specimens, besides the collections made by persons connected with the Museum, which are for the most part, from necessity, packed in boxes.

THE CURRENT WORK OF THE MUSEUM.

The accompanying report of the Botanist, Mr. C. H. Peck, will give an account of the work in his department, and the addition to the herbarium of 142 species of plants, of which 68 are new to this collection. On the second floor of the Museum, a collection of fungi is arranged for public inspection.

The Unionidæ and other fresh-water shells, with numerous sections of the same, referred to in a former report as the work of Mr. Geo. B. Simpson, has been in part arranged in cases, and the collection is in progress toward completion. A collection of Unionidæ and other fresh-water shells, made by Dr. D. N. DeTarr, assistant in the Museum during the summer of 1881, has been arranged by him in cases provided for that purpose.

A considerable part of the insect collection, which was made by Mr. Lintner for the State Museum, has been placed for exhibition in one of the large table-cases on the second floor. Although subject to deterioration from the influence of light, the Director has deemed it proper to place some portion of this collection where it can be seen by visitors to the Museum.

In the Department of Osteology, Anatomical and Alcoholic Specimens, and the preparation of translucent sections of fossils and minerals, under the charge of Dr. J. W. Hall, the work has been continued as heretofore; except that the general duties of the Museum (in the absence of an assistant in the Zoölogical Department, and the work heretofore performed by the taxidermist) have fallen upon the assistant who has charge of this department.

In addition to the above large translucent sections of rocks and fossils, nearly 300 sections of shells of Brachiopoda have been prepared by Mr. Beecher by hand for microscopic study. These sections, many of them minute, are mounted on glass slides of the standard size, and each one labeled with the generic and specific name. The study of the minute structure of the shells of brachiopoda is of much importance in determining the generic relations of this class of fossils, and has heretofore been too much neglected, from the difficulty of obtaining satisfactory specimens. This work was commenced by me several years since, in connection with the revision of the genera of the Brachiopoda, of which about thirty plates have already been prepared as a part of the palæontological work of the State.

The present collection has already furnished some important facts in regard to the classification of the Orthidæ and Strophomenidæ, and I propose to examine in this manner the shells of all the genera of Brachiopoda, which are known in the Palæozoic formations of New York.

Among the miscellaneous work of the Museum during the past year, a small geological map of New York (drawn with pen and the area of the formations indicated by different modes of lining) has been prepared to accompany the article on the History of the Geological Survey of New York, to be published in the "Civil Service of the State of New York." We have also prepared a large colored map, preparatory to the publication of a geological map of the State, embodying the results of geological investigation since 1844, which is the date of the last published geological map of the State.

During the past summer a single paper of fifty-nine pages, on the fossil corals of the Niagara and Upper Helderberg groups, has been published in advance of the Thirty-fifth Report of the State Museum.

COLLECTIONS IN THE FIELD.

Almost the only geological collections made in the field during the past year were from the Oriskany sandstone in the vicinity of Knox, in Albany county, and from the Mohawk valley. The latter were from the fresh exposures along the outcrops made by the excavations on the line of the West Shore railroad. These collections represent the Laurentian, the Calciferous sandstone, the Trenton limestone and the Utica slate. A number of specimens from these collections will be available for the State Museum, and the remainder will go into the duplicate material for distribution. The interest in these collections is due to the fact that they illustrate the succession of beds, and the direct contact of the Calciferous sandstone with the Upper Laurentian gneiss, proving the absence of the Potsdam sandstone along the Mohawk valley.

A collection of specimens of the iron ores from Essex county has been made for the Museum.

COLLECTIONS ARRANGED IN THE TABLE-CASES OF THE MUSEUM.

A series of specimens from the Utica slate, illustrating the morphological development of *Triarthrus Becki*, has been labeled and arranged in the table-case of the palæontological series. This is the only series of the kind in the Museum, and is a very valuable addition to the collections of fossil Crustacea.

The largest addition to the arranged collections during the year is from the Niagara group of Waldron, Indiana. The specimens were selected from many thousand examples, and the whole arranged series represents a most complete exhibition of the Niagara fauna of Indiana. It is especially valuable for comparison with the same horizon in New York and elsewhere. This collection contains many typical specimens used in the illustration and descriptions of the species, and many very fine examples of other species. With the exception of the Schoharie collections, it is the largest and most complete representation of the fossils of a single locality in the State Museum.

A list of these additions is given elsewhere.

The specimens illustrated on the plates of Lamellibranchiata, in vol. v, part 1, Palæontology of New York (unpublished), have been numbered and arranged according to the plates, and a partial series selected for the Museum collections. The delay in the publication of this volume has been to the disadvantage of any final work in this series of fossils. The large collection of Devonian Lamellibranchiata, belonging to the State, cannot be made use of for the purposes of distribution, until the publication of this volume is completed.

A full set of the plates of the Lamellibranchiata, of vol. v, part 1, Palæontology of New York (as above), with manuscript descriptions of the figures, was sent to the Geological Survey of Kentucky, on application of Mr. Henry Nettelroth, who has in his charge the preparation of the report upon the fossil Mollusca of Kentucky.

The Director of the Museum, as State Geologist, has considered it a duty to furnish this information regarding unpublished work, from the fact of the long delay in presenting our own publications for the use of scientific workers.

A pamphlet of more than sixty pages, containing descriptions of a part of these fossils, was published in 1869. The manuscript descriptions of the remaining species for the then proposed vol. v, part 1, have long been ready for the press, and were communicated with the Museum report two years since, but up to this time have not yet been printed.

The collections made in previous years from the Lower Carboniferous limestone of Spergen Hill, Indiana, and from the Lower Silurian on the shores of Lake Champlain, have been unpacked, cleaned and ticketed; and a large portion of these are repacked in boxes for want of space to arrange them. The remainder are now accessible for the selection of duplicates.

DISTRIBUTION OF DUPLICATE FOSSILS AND MINERALS.

Every year shows an increasing number of applications for labeled collections of fossils and minerals. Some of these are outside of the regulations adopted by the Board of Regents for the distribution of collections; but the Director has in many instances felt constrained to listen to such applications, believing that it would inure to the advantage of the Museum. In such cases he has made liberal use of his private collections of rocks and iron ores of Northern New York and other localities, from which the State Museum does not possess duplicates.

In addition to the general distribution above named, there have been sent, by authority of the Regents, a small collection of Oriskany sandstone fossils and a large stump of *Psaronius erianus*, to McGill College, Montreal, and presented to the Peter Redpath Museum.

In anticipation of the early removal, to some public building, of the large collections of fossils which have long been in the custody of the State Geologist, a large portion of the drawers containing them, about 1,200 in number, have been carefully examined and in part rearranged, the specimens cleaned, etc. The fossil corals, occupying about 500 close drawers, have been systematically arranged, and are in a cleanly and proper condition for removal at any time. The greater part of the collection is packed in boxes, and these are ready for removal as soon as a proper place shall be provided.

It is my melancholy duty to record the death of Mr. James A. Hurst, who has for more than thirty years acted as the taxidermist of the State Museum. Nearly all the stuffed specimens of birds and mammals have been mounted by him; and through his care and watchfulness they have remained in very excellent condition. I shall consider it incumbent on me to communicate an obituary notice to the Regents for incorporation in the report, so soon as I shall be able to obtain the necessary data.

I am, very respectfully, your obedient servant,
JAMES HALL, *Director.*

ADDITIONS

TO THE COLLECTIONS OF THE STATE MUSEUM DURING THE YEAR 1882.

I. BOTANICAL.

From Mrs. L. A. MILLINGTON, Glens Falls, N. Y., specimens of young plants of *Epilobium molle*, Torr., bearing thickened subterranean scale-like leaves.

From Miss M. BOWLES, Columbia, Tenn., a specimen of *Polypodium incanum*, Pursh.

From C. D. HILL, Tunis, N. Y., a specimen of *Calystegia Sepium*, L., with pubescent stem and short flowers.

From J. F. SHOEMAKER, Luverne, Minn., specimens of *Oxybaphus nyctagineus*, Sweet.

From J. HOWELL, Arthur, Oregon, specimens of *Berberis Aquifolium*, Pursh; *Puccinia mirabilissima*, Pk., and *Dædalea vorax*, Harkness; also of wood of *Abies Douglasii*, injured by the *Dædalea.*

From S. B. GRISWOLD, Albany, N. Y., a dried flower of the Century plant, *Agave Americana.*

From CHARLES E. SMITH, Philadelphia, Pa., very fine specimens of both pistillate and staminate plants of *Corema Conradii*, Torr.

From C. F. CORNELIUS, Willow Brook, N. Y., a specimen of *Cynoglossum officinale*, L.

From Rev. WASHINGTON RODMAN, Astoria, N. Y., specimens of a new edible fungus, *Agaricus Rodmani*, Pk.

From H. N. JOHNSON, Coeymans, N. Y., fine specimens of *Sagittaria pusilla*, Nutt.; also specimens of a singular form of *Thalictrum anemonoides*, Mx.

From W. C. STEVENSON, Jr., Philadelphia, Pa., specimens of *Puccinia Myrrhis*, Schw.

From S. J. BOWMAN, Albany, N. Y., specimens of *Ranunculus multifidus*, Pursh.

From Hon. G. W. CLINTON, Albany, N. Y., specimens of *Eragrostis poœoides*, Bv.; *E. Purshii*, Schrad.; *Tillæa simplex*, Nutt., and *Amarantus blitoides*, Wats.

From FELIX VON THUMEN, Vienna, Austria, specimens of one hundred and ninety-one species of fungi.

From W. RUSSELL, Albany, N. Y., per J. Gebhard, Jr., a fine specimen of the Chinese "leechee nut."

From E. L. HANKENSON, Newark, N. Y., specimens of *Sedum reflexum*, L.; *Azolla Caroliniana*, Willd., and hybrid *Salix cordata* x *sericea.*

From W. M. CANBY, Wilmington, Del., specimens of *Tillæa simplex,* Nutt.

From CLARENCE LOWN, Poughkeepsie, N. Y., specimens of the very rare ferns, *Cheilanthes vestita,* Sw.; *Asplenium Bradleyi,* D. C. Eaton, and *Asplenium ebenoides,* R. R. Scott; the last one new to the State.

From Prof. W. R. DUDLEY, Ithaca, N. Y., specimens of sixty-two species of plants, several of which are new to the Herbarium.

II. ZOOLOGICAL.

A specimen of *Macrosila quinquemaculata,* the tomato sphinx, from R. F. WELLER, Washington Valley, Kent Co., Rhode Island.

Thyræus abbotii, on grape vines, from J. VANDELOO, Albany, N. Y.

Specimen of *Blatta,* from W. R. Ross, Greenbush, N. Y.

Large specimens of *Meandrina clivosa, Madrepora convexa* and *Favasites,* the latter polished; purchased from Mr. WOODMAN, New York city.

A pair of "dead-locked" elk horns, purchased of Mr. E. F. PHILBROOK, Des Moines, Iowa.

Collection of land and fresh-water shells from Georgia, purchased from Prof. R. E. CALL, David City, Nebraska.

III. GEOLOGICAL AND MINERALOGICAL.

Five samples of *Conularia crustula,* White, Upper Coal Measures, Kansas City, Mo.; by exchange from W. J. PARRISH, Kansas City, Mo.

A polished specimen of crystalline limestone, from G. E. WOODRUFF, Canton, St. Lawrence Co., N. Y.

Slab containing impression and fragment of *Lepidodendron,* from FRANK GOULD, Esq., Oneonta, N. Y.

Fragment of *Lepidodendron,* from MEIGS CASE, M. D., Oneonta, N. Y.

Two large specimens of Galena, from Galena, Ill., from DUNCAN CAMPBELL, Esq.

Numerous specimens of gypsum in florescent forms and calcite from Mammoth Cave, Ky., From HENRY RUSSELL, Esq., Albany.

Ten specimens of fossils from the Portage group, Perry, N. Y., in exchange from the PERRY UNION SCHOOL, J. P. Bishop, principal, Perry, Wyoming Co., N. Y.

Odontornithes (toothed birds). Casts of bones of *Hespiromis regalis,* twenty-six specimens, from Prof. O. C. MARSH, Yale College Museum, New Haven, Conn.

Ramphorhynchus phyllurus, Marsh (plaster cast), from the lithographic limestones, Jurassic formation of Bavaria; the original specimen is the only one yet found showing the membranes of the tail and wings; from Prof. O. C. MARSH, Yale College Museum, New Haven, Conn.

Two specimens of *Dicranograptus bicornis,* Kenwood, Albany, from JAMES F. FLANNERY, Albany.

Ten slabs of Trenton limestone with identified fossils from Dutchess and Orange counties; from Prof. W. B. DWIGHT, Vassar College, Poughkeepsie, N. Y.

Twelve specimens of graptolites from the Moffat Shales of Hartfell, Scotland, from JAMES DAIRON, Esq., of the Geological Society, Glasgow, Scotland.

IV. ETHNOLOGICAL, ETC.

A stone formerly marking a point in the boundary line between New York and Pennsylvania. For deposit in the historical collections of the Museum. From Dr. DAVID MURRAY, Secretary Board of Regents.

Several specimens of prepared flax brought from Albany by Col. Rochester in 1822, from Mrs. GATES.

V. TO THE LIBRARY.

1. *By Donation.*

Report of the Commissioner of Agriculture for 1880.

Bulletin American Geographical Society, New York. 1881, Nos. 2, 3, 4, 5; 1882, No. 1.

Journal of the American Geographical Society, New York. Vols. XII, XIII. From the SOCIETY.

Geological Survey of Michigan, vol. IV.

Circulars from John Hopkins University, No. 13, February, 1882. Baltimore.

Population and Resources of Alaska.

Fourth Annual Report of the U. S. Geological Surveys. (King)

Bulletin of the United States Geological and Geographical Surveys, vol. VI, Nos. 2, 3.

Second Report, U. S. Entomological Commission on the Rocky Mountain Locust.

Beiträge zur Paläontologie von Osterreich-Ungarn.

The Geological and Natural History Survey of Minnesota. Ninth annual report. From Prof. N. H. WINCHELL.

United States Entomological Commission, bulletin No. 7.

Anales del Museo Nacional de Mexico Tomo II.

Smithsonian Report, 1880.

Official Gazette U. S. Patent Office, vol. 21, Nos. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26; vol. 22, Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 and 26; errata, etc., vol. 21, January 3, to June 27, 1882.

Alphabetical list of patentees and inventors for the half year, January to June, 1882, inclusive; do. July to December, 1881, inclusive.

Memoirs of the Boston Society of Natural History, vol. 3, No. 5.

Circulars of Information of the Bureau of Education, No. 6, 1881, and No. 1, 1882.

Department of Agriculture, special report, Nos. 31, 42, 43, 44, 45, 46, 47, 48, 49, 52.

Library of Harvard University, bibliographical contributions, No. 13; Fossil Insects, by Samuel H. Scudder.

Official Gazette U. S. Patent Office, vol. XX, July 5, to December 27, 1881. (Index, etc.)

Carcenologiske Bidrag til Norges Fauna of G. O. Sars. Christiana, 1879.

Enumeratio Insectorum Norvigicorum Fasciculum, V. H. Siebke. Christiania, 1880.

Bidrag Nordenfjeldske Narges Insektfauna. John Sahlberg, Christiana, 1880.

Bidrag til Kundskaben om Norges Lepidopterfauna. J. Sparre Schneider, Christiania, 1881.

Ett försök att Bestämma en del af de Utaf. H. Strom beskrifna Narksa Insekter. H. D. J. Wallengren, Christiania, 1880.

Bemaerkninger til H. Siebke's Enumeratio Insectorum Norvegicorum. Fasecals v. Pars, 1 etc. W. M. Schoyen, Christiania, 1880.

Department of Agriculture — Florida, its Climate, Soil, Productions and Agricultural Capabilities. Washington, 1882.

Book list. Bernard Quaritch, June, 1882.

Studies from the Biological Laboratory John Hopkins University, Baltimore, vol. II, No. 3, June, 1882.

Fragments of the Coarser Anatomy of Diurnal Lepidoptera. S. H. Scudder, 1882.

Science Observer, vol. IV, Nos. 1, 2.

Bulletin of the Library Company of Philadelphia. July, 1882.

Sitzungsberichte und Abhandlungen, Jahrgang 1881. Dresden, 1882.

First Annual Report of the Bureau of Ethnology. J. W. Powell, 1879–1880.

United States Commission of Fish and Fisheries — Commissioner's Report of 1879–1882.

Bulletin of the American Museum of Natural History, Central Park, New York, vol. 1, Nos. 2, 3.

Bacteria, by Chas. S. Dolley, M. D., Rochester, N. Y.

Zwölfter Bericht der Naturforschenden Gesellschaft in Bamberg, 1882.

Accessions to Indian Museum, Calcutta, 1881. Appendix A.

Auditor of Accounts, annual report, city of Boston, Mass., 1881, 1882.

American Museum of Natural History, 13th annual report. February 15, 1882.

Archives du Musée Teyler, Serie II, 2d Partie.

Sitzungsberichte und Abhandlungen der Naturwissenschaftlichen Gesellschaft, Isis in Dresden, 1822; Januar bis Juni.

Bulletin de L' Institut National Genevois. Tome XXIV, 1882.

R. Biblioteca Nazcionale in Firenze Sezione di Scienzi Fisiche e Naturale 1 Eccher (A), 2, 3 Tommasé (D), 4 Cavanna (G), 5 Mencci (F).

Annual Report of the Commissioner of Patents for the year 1881. Washington, 1882.

2. *By Purchase and Exchange.*

Journal of the Cincinnati Society of Natural History. July, 1882, vol. V, Nos. 2, 3.

American Journal of Science and Art, 3d series. Vol. XXIII, 133 to 138, inclusive; vol. XXIV, 139, 140, 141, 142, 143, 144.

American Naturalist, vol. XVI, 1 to 12 inclusive.

Encyclopædia Britanica, vols. XIII and XIV.

The Butterflies of North America, by W. H. Edwards. Second series, part X.

Proceedings of the Davenport Academy of Natural Sciences, vol. III, part 2, 1882.

APPENDIX A.

List of Niagara Fossils from Waldron, Indiana, arranged in Table Cases in the State Museum of Natural History. September, 1882:

Species.		Examples.
1.	Buthrotrephis gracilis var. crassa, H. (typical)	1
2.	Receptaculites subturbinatus, Hall	2
3.	“ sacculus (type specimen)	1
4.	Astylospongia præmorsa, Goldf	8
5.	Deudrograptus (s. g. Chaunograptus) novellus H. (type)	1
6.	Streptelasma (Duncanella) boreale, Nich	16
7.	Aulopora precius, Hall	2
8.	Streptelasma radicans, Hall	12
9.	Zaphrentis celator, Hall	2
10.	Favosites Forbesi, var. occidentalis, Hall	11
11.	“ “ “ “ “ (slab)	1
12.	“ “ “ “ “ (bases)	2
13.	“ “ “ “ “ (small cells)	2
14.	“ “ “ “ “ (typical) incipient growth of a colony on *Meristella nitida*	1
15.	Favosites Forbesi var. occidentalis, Hall (typical), cell-tubes elongate and a very extended epitheca	1
16.	Favosites Forbesi var. occidentalis, Hall (typical), pyriform specimen	1
17.	Favosites Forbesi var. occidentalis, Hall, attached to crinoid stems	2
18.	Favosites Forbesi var. occidentalis, Hall, double carallum	1
19.	“ “ “ “ “ epitheca decorticated,	1
20.	“ “ “ “ “ (typical), showing opercula to the cells	1
21.	Favosites Forbesi var. occidentalis, Hall, with cell-tubes exposed	1
22.	Favosites Forbesi var. occidentalis, Hall, longitudinal section,	1
23.	“ “ “ “ “ transverse section	1
24.	Lichenalia concentrica, Hall, large specimen (typical)	1
25.	“ “ “	4
26.	“ “ “ poriferous side	5
28.	“ “ “ var. maculata, poriferous side.	1
29.	Saccocrinus Christyi, Hall (two figured specimens, typical).	7
30.	Lyriocrinus Melissa, Hall (one type specimen)	8

	Species.	Examples.
31.	Eucalyptocrinus crassus, Hall, series from young to mature individuals	20
31.	Eucalyptocrinus crassus, Hall, arms, calyx and a portion of the column	1
32.	Eucalyptocrinus crassus, Hall, elongate forms of calices	2
33.	" " " three heads lying bedded in the shale parallel and side by side	1
34.	Eucalyptocrinus ovalis, Troost., showing variation in size	5
35.	" constrictus, Hall (type)	1
36.	Roots of Eucalyptocrinus	1
37.	" " "	1
38.	Eucalyptocrinus cælatus, Hall, series showing variation in size and form	13
39.	Eucalyptocrinus cælatus — typical, a very fine specimen consisting of the body with the arms and a portion of the column. The column and roots have been extended and restored from other individuals so that the entire size and appearance of a perfect specimen is produced (Placed in a wall-case on account of the size of the specimen.)	1
40.	Niagara shale, with Eucalyptocrinus cælatus (3), Eucalyptocrinus ovalis (1), Eucalyptocrinus crassus (1), Eucalyptocrinus column, with attached Favosites (1), Spirifera radiata (3), Rynchonella Indianensis (2), Spirifera crispa var. (1), Rhynchotreta cuneata (1), Streptelasma (Duncanella) boreale (1), Favosites Forbesi, var. occidentalis (1), Trematoporo echinata (1), Trematopora osculum (1)	1
41.	Lecanocrinus pusillus, Hall (1 type specimen), and series showing form and variation	7
42.	Ichthyocrinus subangularis, Hall (2 type specimens)	3
43.	Poteriocrinus ? calyx, Hall (type)	1
44.	Dendocrinus ancilla, Hall (type)	1
45.	Macroslytocrinus striatus, Hall	6
46.	" " var. granulosus (types of var.)	5
47.	" " fasciatus, Hall (typical)	4
48.	Cyathocrinus Polyxo, Hall	5
49.	Stephanocrinus gemmiformis, Hall	5
50.	Codaster (Stephanocrinus ?) pulchellus, Miller & Dyer (typical)	6
51.	Codaster pentalobus, Hall (type)	1
52.	Slab with Eucalyptocrinus crassus, Lyriocrinus Melissa, Favosites Forbesi, var. occidentalis	1
53.	Shale, with Saccorinus Cristyi, bearing the impressions of segments of a crinoid column, Eucalyptocrinus crassus, Hall	1
54.	Cyathocrinus nucleus, Hall (typical)	4
55.	Glyptocrinus Carleyi, Hall (typical)	3
56.	Eucalyptocrinus crassus, longitudinal section	2
57.	" " transverse sections	4
58.	Ampheristocrinus typus, Hall (types)	3
59.	Pterinea brisa, Hall, typical	3
60.	Ambonychia acutirostra, Hall	1

Species.		Examples.
61.	Goniophora speciosa, Hall, type	1
62.	Conularia infrequens, type	1
63.	Strophostylus cyclostomus, Hall, a series from small to large individuals	12
64.	Strophostylus cyclostomus, Hall, showing columella	2
65.	“ “ “ var. with elevated spire	4
66.	Platystoma Niagarense, Hall, a series showing gradation in size	10
67.	Platystoma Niagarense, Hall, showing form of aperture	2
68.	“ “ “ var. with last volution free for a portion of its extent	2
69.	Two slabs containing Platystoma Niagarense	2
70.	Platystoma plebeium, Hall	1
71.	Cyrtolites sinuosus, Hall	1
72.	Orthoceras annulatum, Sow., typical	1
73.	“ “	1
74.	“ “ typical longitudinal section	1
75.	“ “ bedded in shale	1
76.	“ “ compressed specimen	1
77.	“ “ small specimen	1
78.	“ medullare, Hall, longitudinal section	1
79.	“ simulator, Hall, typical	1
80.	“ “ “	4
81.	Trochoceras Waldrenense, Hall	2
82.	Orthoceras Amycus, Hall (type)	1
83.	Nautilus Oceanus	1
84.	Crania Siluriana, Hall; three specimens on Eucalytocrinus crassus, one specimen on Platystoma Niagarense, two specimens on Meristina Maria	4
85.	Strophemena rhomboidalis, Wilc., seven specimens showing exterior form, three specimens showing muscular markings on interior of valves	10
86.	Strophodonta striata, Hall	5
87.	Meristina Maria, Hall, series showing gradation in form and size	11
88.	Meristina nitida, a series showing gradation in form and size,	18
89.	Strophodonta profunda (typical)	1
90.	Streptorhynchus tenuis, Hall	1
91.	Rhynchonella Stricklandi, in series	15
92.	“ Whitii, in series	21
93.	“ acinus, in series	16
94.	“ neglecta, in series, 1 type of var	19
95.	“ Indianensis, in series, 3 types of var	18
96.	Meristella rectirostra, Hall (types)	12
97.	Leptaena transversalis, Wahl	2
98.	Rynchonella Stricklandi with Favosites Forbesi, var. occidentalis, Hall	1
99.	Spirifera radiata with Platystoma Niagarense	1
100.	Spirifera radiata, Sowerby, in series	12
101.	“ eudora, Hall	2
102.	“ crispa, Hisinger, in series	19
103.	“ “ var. simplex, in series	9

Species	Examples.
104. Pentamerus fornicatus var. H. Type of var.	1
105. Anastrophia internascens, Hall, in series	15
106. Rhynchotreta cuneata var. Americana, Hall, types of var. in series	17
107. Small shells washed from the soft shales	+50
108. Eichwaldia reticulata, Hall	15
109. Chonetes Nova-Scotica, Hall	1
110. Slab with Rhynchonella Whitii, Rhynchonella Indianensis, Platystoma Niagarense	1
111. Cornulites proprius, Hall, on Spirifera radiata	1
112. " " " on Trematopora osculum	1
113. " " " on Rhynchonella Stricklandi, a type	1
114. Cornulites proprius, Hall, on various objects, 1 type specimen on trematopora	6
115. Cornulites proprius, Hall, on Platystoma Niagarense, a type.	1
116. " " " apices on gasteropods	3
117. " " " " " Meristina	3
118. " " " separate tubes	3
119. Dalmanites verrucosus, Hall, series of heads	7
120. " " " tails	3
121. Slab with Dalmanites verrucosus (tail), Strophodonta striata, Trematopora osculum	1
122. Lichas breviceps, Hall, thorax and tail	1
123. " " " tail	1
124. " " " glabellas	2
125. Slab with Dalmanites vigilans (heads) five, Dalmanites vigilans with cornulites, one; Lichas breviceps (head), one; Cyphaspis Christyi (heads), two; Streptorhynchus subplana, one; Lichenalia concentrica, one, Trematopora spiculata, one; Trematopora subimbricata, one; Trematopora echinata, two	1
126. Calymene Niagarensis, Hall	6
127. Cyphaspis Christyi, Hall	1
128. " " " enrolled	3
129. " " " and hypostoma of Lichas Boltoni var occidentalis	1
130. Dalmanites vigilans, Hall, entire specimen typical	1
131. " " " head	1
132. " bicornis, Hall, frontal margin	1
133. " verrucosus, Hall, frontal margin	2
134. Homalonotus delphinocephalus, Green	1
135. Illænus (Bumastus) Ioxus, Hall (typical) glabella	1
136. " " " " " tail	1
137. " armatus, Hall (1 typical) 2 glabellas, 1 pygidium	3
138. Lichas Boltoni (Bigsby) var. occidentalis, Hall, glabella and hypostoma	1
	+620

Making altogether eighty-two species which are represented in more than six hundred and twenty examples.

The Bryozoans not arranged in the cases at the Museum occupy fifteen drawers. This collection includes the type specimens of all the new species described in volume X of the *Transactions of the Albany Institute*, and also the specimens used in describing the species figured in the documentary edition of the Twenty-eighth Report.

The following list includes specimens mostly from other classes which have been selected and prepared for the collections, but for which there is no space to arrange them in the cases at the Museum :

Fucoids	1
Sponges	14
Favosites spinigerus	14
" Forbesi, var. occidentalis	1
Streptelasma	3
Chætetes	3
Lichenalia	5
Ceramopora	3
Slabs of Brachiopoda	26
Orthis hybrida	16
" " var	12
" elegantula	24
Nucleospira pisiformis	14
Crania setigera	10
Miscellaneous	10
Alrypa reticularis	25
Retzia evax	25
Orthis biloba	10
Tripilesia putillus (types)	2
Pholidops ovalis	11
Zygospira minima (type)	1
Lingula gibbosa (types)	2
Cœlospira disparilis	16
Streptorhynchus subplana	18
Strophodonta striata	7
Chonetes	10
Spirifera bicostata var. petita (types of var.)	6
Lamellibranchiata (1 type)	16
Gasteropoda	4
Cornulites	10
Coleolus spinulus, type	1
Crustacea, several typical specimens	31
Crinoidea	38
	399

The entire collection is represented in more than 1,019 examples.

APPENDIX B.

LIST OF GENERA AND SPECIES OF BRACHIOPODA, OF WHICH SECTIONS HAVE BEEN PREPARED FOR THE MICROSCOPE.

Orthis testudinaria.
" Vanuexemi.
" biforata.
" Iowensis.
" borealis.
" perveta.
" ? Strophomenoides.
" Penelope.
" elegantula.
" tricenaria.
" occidentalis.
" Tulliensis.
" Clytie.
" plicatella.
" hybrida.
" impressa.
" flabella.
" subquadrata.
" concinna.
Strophodonta magnifica.
" concava.
" demissa.
" arcuata.
" perplana.
" reversa.
" nacra.
" striata.
Strophomena alternata.
" rhomboidalis.
Strophonella semifasciata.
Chonetes coronata.
Streptorhynchus hipparionyx.
" subplana.
" crenistria.
Tropidoleptus carinatus.

Rensselæria ovalis.
Atrypa aspera.
Pentamerella arata.
Crania Hamiltoniæ.
Eichwaldia reticulata.
Productus subulatus.
Retzia evax.
Spirigera Roysii.
Leptocoelia concava.
" imbricata.
Vitulina pustulosa.
Spirifera laevis.
" zigzag.
" fimbriata.
" mucronata.
" Hungerfordi.
Spiriferina spinosa.
Syringothyris textus.
Cyrtina Hamiltonensis.
Orthyris spiriferoides.
Camarella congesta.
Trematospira nobilis.
" camura.
Stricklandinia.
Meristina maria.
Leptaena sericea.
Nucleospira pisiformis.
Lingulepis pinnaeformis.
Rhychonella capax.
Anastrophia internascens.
Zygospira modesta.
Ambocoelia umbonata.
" præumbona.
Rhynchotreta cuneata.

REPORT OF THE BOTANIST,

CHARLES H. PECK.

REPORT OF THE BOTANIST.

Hon. David Murray, LL. D.,

Secretary of the Board of Regents of the University:

Sir — Since the date of my last report, specimens of one hundred and forty-two species of plants have been mounted and placed in the State Herbarium, of which sixty-eight were not previously represented therein. The specimens of the remaining species represent new forms or varieties of species before represented, or exhibit some features or characters not well shown by the older specimens. A list of the species of which specimens have been mounted is hereinafter given and marked (1).

By reason of the veto, by the Governor, of the appropriation for the reimbursement of the expenses of the Botanist for the years 1880 and 1881, it was not deemed prudent by me to advance any more money to meet these expenses. I have, therefore, been obliged to devote myself to the accomplishment of such work as could be done with the materials already on hand, and I have no additions to the Herbarium by the collecting of the Botanist, to report. This interruption of the work is to be regretted since it delays its completion and thereby increases the cost. If it shall be deemed best to continue the work of supplying deficiencies in the Herbarium and of developing a knowledge of the cryptogamic botany of our State, it is desirable that either the salary of the Botanist be increased sufficiently to enable him to meet the necessary expenses out of his own pocket, or else that an appropriation for these expenses be made in advance.

As usual, numerous specimens have been contributed to the Herbarium by various correspondents and other co-laborers in botany. A list of the contributors and of their respective contributions is marked (2).

Some of the contributed specimens represent plants that are new to the Herbarium and have not before been reported, others are rare plants from newly-discovered localities, or specimens that exhibit some peculiar variation in the species, and for these or other reasons are worthy of notice. New stations of rare plants, remarks and observations are recorded in a section marked (3).

Among the contributed specimens is a new species of edible fungus belonging to the genus Agaricus, subgenus Psalliota, and closely related to the common edible mushroom, and its near relative the horse mushroom. The mushrooms are so interesting by reason of their frequent use as an article of food, and the three species mentioned are so variable and so intimately related to each other, that in pursuance of a plan already adopted in two previous reports (in which synopses of the subgenera Amanita and Lepiota have been given), I have thought best to give a full descriptive synopsis of all our New York species of the subgenus Psalliota. In this monograph the descriptions have been revised and made more complete, the dimensions of the spores have been given and copious remarks have been added with the design of pointing out more clearly the distinguishing features of the species and of aiding in their discrimination. It is marked (4).

(1.)

PLANTS MOUNTED.

Not new to the Herbarium.

Ranunculus abortivus, *L.*
Raphanus Raphanistrum, *L.*
Brassica Sinapistrum, *Boiss.*
Viola Selkirkii, *Pursh.*
Geranium maculatum, *L.*
Acer rubrum, *L.*
Trifolium repens, *L.*
Rubus triflorus, *Rich.*
Opuntia Rafinesquii, *Engelm.*
Tiarella cordifolia, *L.*
Mitchella repens, *L.*
Viburnum nudum, *L.*
Heracleum lanatum, *Mx.*
Tanacetum vulgare, *L.*
Vaccinium corymbosum, *L.*
V. Pennsylvanicum, *Lam.*
Nyssa multiflora, *Wang.*
Scutellare galericulata, *L.*
Marrubium vulgare, *L.*
Apocynum cannabinum, *L.*
Polygonum orientale, *L.*
Fraxinus Americana, *L.*
F. pubescens, *Lam.*
Quercus alba, *L.*
Q. Prinus, *L.*
Q. rubra, *L.*
Q. coccinea, *Wang.*
Q. tinctoria, *Bart.*
Populus tremuloides, *Mx.*
P. grandidentata, *Mx.*

Potamogeton crispus, *L.*
P pusillus, *L.*
P pectinatus, *L.*
P. gramineus, *L.*
Smilax hispida, *Muhl.*
Trillium grandiflorum, *Salisb.*
Polygonatum giganteum, *Diet.*
Uvularia sessilifolia, *L.*
Heteronthera reniformis, *R. and P.*
Eleocharis tuberculosa, *R. Br.*
Scleria pauciflora, *Muhl.*
Carex stricta, *Lam.*
C. Muhlenbergii, *Schk.*
C. cephalophora, *Muhl.*
C. Emmonsii, *Dew.*
C. Pennsylvanica, *Lam.*
C. tenera, *Dew.*
C. lagopodioides, *Schk.*
C. adusta, *Boott.*
C. granularis, *Muhl.*
C. gracillima, *Schw.*
C. cristata, *Schw.*
C. mirabilis, *Dew.*
C. virescens, *Muhl.*
C. vulpinoidea, *Mx.*
C. plantaginea, *Lam.*
C. laxiflora, *Lam.*
Zizania aquatica, *L.*
Stipa avenacea, *L.*
Aira flexuosa, *L.*

Bromus racemosus, *L.*
Poa trivialis, *L.*
Eragrostis pilosa, *Bv.*
Aspidium Boottii, *Tuckm.*
Osmunda cinnamomea, *L.*
Agaricus serotinus, *Schrad.*
A. æruginosus, *Curt.*
Agaricus sapidus, *Kalchb.*
Polyporus adustus, *Willd.*
P. hispidioides, *Pk.*
Trametes mollis, *Sommf.*
Corticium læve, *Pers.*
C. incarnatum, *Pers.*
C. lilacinofuscum, *B. and C.*

New to the Herbarium.

Malva crispa, *L.*
Tillæa simplex, *Nutt.*
Sedum acre, *L.*
Amarantus blitoides, *Wats.*
Sagittaria pusilla, *Nutt.*
Eragrostis Purshii, *Schrad.*
Agaricus alluviinus, *Pk.*
A. rubrotinctus, *Pk.*
A. albus, *Schæff.*
A. pascuus, *Pers.*
A. sinuatus, *Fr.*
A. fastibilis, *Fr.*
A. sulcatipes, *Pk.*
A. hærens, *Pk.*
A. tiliophilus, *Pk.*
A. nitidipes, *Pk.*
A. epimyces, *Pk.*
Hygrophorus fuligineus, *Frost.*
H. flavodiscus, *Frost.*
Marasmius salignus, *Pk.*
Polyporus immitis, *Pk.*
P. fraxinophilus, *Pk.*
Irpex crassus, *B. and C.*
I. mollis, *B. and C.*
Corticium effuscatum, *C. and E.*
Thelephora rosella, *Pk.*
Cyphella læta, *Fr.*
Phoma cucurbitale, *B. and C.*
Sphæropsis Caryæ, *C. and E.*
Discella hysteriella, *Pk.*
D. albomaculans, *Pk.*
Glœosporium fraxinea, *Pk.*
Septoria cannabina, *Pk.*
S. Sicyi, *Pk.*
Septoria Cirsii, *Niessl.*
S. Calystegiæ, *Sacc.*
S. musiva, *Pk.*
Phyllosticta Cratægi, *Pk.*
P. variabilis, *Pk.*
Protomyces macrosporus, *Ung.*
Ustilago pallida, *Schrœt.*
Acalyptospora Populi, *Pk.*
Macrosporium transversum, *Pk.*
Alternaria tenuis, *Nees.*
Ellisiella caudata, *Sacc.*
Botrytis ceratioides, *Pk.*
Dactylium dendroides, *Fr.*
Verticillium Lactarii, *Pk.*
Cercospora Tiliæ, *Pk.*
C. Lepidii, *Pk.*
C. Daturæ, *Pk.*
C. varia, *Pk.*
C. longispora, *Pk.*
Ramularia Vaccinii, *Pk.*
R. Ranunculi, *Pk.*
R. Hamamelidis, *Pk.*
R. aquatilis, *Pk.*
Asterophora Pezizæ, *Cd.*
Peziza lætiruba, *Cke.*
P. singularia, *Pk.*
Tympanis Nemopanthis, *Pk.*
Cenangium betulinum, *Pk.*
Triblidium clavæsporum, *Pk.*
Ascomyces deformans, *Berk.*
Gymnascella aurantiaca, *Pk.*
Valsa tomentella, *Pk.*
Sphærella fraxinea, *Pk.*
Venturia curviseta, *Pk.*

(2.)

CONTRIBUTORS AND THEIR CONTRIBUTIONS.

Mrs. L. A. Millington, Glens Falls N. Y.

Epilobium molle, *Torr.*

Miss M. Bowles Columbia, Tenn.

Polypodium incanum, *Pursh.*

C. D. Hill, Tunis, N. Y.

Calystegia Sepium, *L.*

J. F. Shoemaker, Luverne, Minn.

Oxybaphus nyctagineus, *Sweet.*

Charles E. Smith, Philadelphia, Penn.

Corema Conradii, *Torr.*

C. F. Cornelius, Willow Brook, N. Y.

Cynoglossum officinale, *L.*

Rev. Washington Rodman, Astoria, N. Y.

Agaricus Rodmani, *Pk.*

H. N. Johnson, Coeymans, N. Y.

Sagittaria pusilla, *Nutt.*
Thalictrum anemonoides, *Mx.*

W. C. Stevenson, Jr., Philadelphia, Pa.

Puccinia Myrrhis, *Schw.*

S. J. Bowman, Albany, N. Y.

Ranunculus multifidus, *Pursh.*

Hon. G. W. Clinton, Albany, N. Y.

Tillæa simplex, *Nutt.*
Amarantus blitoides. *Wats.*
Eragrostis poæoides, *Bv.*
E. Purshii, *Schrad.*

J. Howell, Arthur, Oregon.

Puccinia mirabilissima, *Pk.*
Dædalea vorax, *Hark.*
Berberis Aquifolium, *Pursh.*
Wood of Abies Douglassii.

S. B. Griswold, Albany, N. Y.

A flower of the Century plant, Agave Americana, *L.*

W. M. Canby, Wilmington, Del.

Tillæa simplex, *Nutt.*

W. Russell, Albany, N.Y.

A specimen of the Chinese "leechee nut."

E. L. Hankenson, Newark, N. Y.

Sedum reflexum, *L.*
Azolla Caroliniana, *Willd.*
Salix cordatax sericea.

Felix von Thumen, Vienna, Austria.

Agaricus geophyllus, *Sow.*
A. mitis, *Fr.*
A. sphinctrinus, *Fr.*
Polyporus cinnabarinus, *Jacq.*
P. pergamenus, *Fr.*
P. cuticularis, *Fr.*
Merulius molluscus, *Fr.*
Dædalea mollis, *Sommf.*
Craterellus sinuosus, *Fr.*
C. cornucopioides, *Fr.*
Thelephora sebacea, *Pers.*
T. fastidiosa, *Fr.*
Stereum lobatum, *Kze.*
Stereum sanguinolentum, *Fr.*
Corticium roseum, *Fr.*
C. radiosum, *Fr.*
C. Juniperina, *Karst.*
Hirneola Auricula-Judæ, *Berk.*
Clavaria fistulosa, *Fr.*
C. Kunzei, *Fr.*
C. cristata, *Holmsk.*
Pistillaria quisquilaris, *Fr.*
Typhula filiformis, *Fr.*
Tremella disciformis, *Fr.*
Geaster triplex, *Jungh.*
Mycogala parietinum, *Rost.*

Æcidium Lampsanæ, *Schultz.*
Æ. Thalictri, *Grev.*
Æ. Pastinaceæ, *Rost.*
Æ. Onosmatis, *Thum.*
Æ. Lithospermi, *Thum.*
Æ. Symphyti, *Thum.*
Æ. Ligustri, *Strauss.*
Æ. Orchidearum, *Desm.*
Æ. Xylostei, *Wallr.*
Æ. Frangulæ, *Schum.*
Æ. Tussilaginis, *Pers.*
Puccinia Oxyriæ, *Fckl.*
P. Asteris, *Schw.*
P. Anemones. *Pers.*
P. Wilcoxiana, *Thum.*
P. crassivertex, *Thum.*
P. Artemisiarum, *Duby.*
P. Brachypodii, *Fckl.*
P. Morthierii, *Kornick.*
P. Cirsii, *Lasch.*
Urocystis primulicola, *Magn.*
Synchytrium Taraxaci, *DeBy.*
Ceratitium Oxyacanthæ, *Desm.*
C. laceratum, *Sow.*
Uredo cancellata, *D. and M.*
U alpestris, *Schroet.*
U. Iridis, *Duby.*
U. digitariæcola, *Thum.*
Coleosporium ochraceum, *Bon.*
C. Campanulacearum, *Fr.*
Uromyces Cacaliæ, *Lev.*
U. Lathyri, *Fckl.*
U. Iridis, *Lev.*
Cronartium ribicola, *Dictr.*
Melampsora Euphorbiæ, *Castr.*
M. Balsamiferæ, *Thum.*
M. Lini, *Tul.*
Podosphaeria biuncinata, *C. and P.*
P. Kunzei, *Lev.*
Uncinula flexuosa, *Pk.*
U. macrospora, *Pk.*
U circinata, *C. and P.*
Calocladia penicillata, *Lev.*
Microsphaeria Viburni, *Schw.*
Erysiphe Martii, *Lev.*
E. lamprocarpa, *Lev.*
Phyllactinia guttata, *Lev.*
Sphaerotheca Castagnei, *Lev.*
S. Niesslii, *Thum.*
Stigmatea Chætomium, *Fr.*
S. confertissima, *Fckl.*
Capnodium pelliculosum, *B. and Br.*
Ceratostoma spurium, *Fr.*
Massaria fœdans, *Fr.*
M. inquinans, *Tul.*
Epichloe typhina, *Tul.*
Cryptospora nigro-annulata, *Rehm.*
Phyllachora Ulmi, *Fckl.*
Ascomyces Quercus, *Cke.*
A. cœrulescens, *Mu.*
A. alutaceus, *Thum.*
Exoascus Alni, *Fckl.*
E. Betulæ, *Fckl.*
Botryosphaeria Berengeriana, *DeNott.*
Calosphaeria tumidula, *Sacc.*
Anthostomella Yuccæ, *Thum.*
Zignoella punctiformis, *Sacc.*
Rœsleria hypogaea, *P. and T.*
Gibberella pulicaris, *Sacc.*
Coleroa Alchemillæ, *Fr.*
Ombrophila Mortheriana, *Rehm*
Bulgaria inquinans, *Fr.*
Durella macrospora, *Fckl.*
Mollisia excelsior, *Karst.*
Helotium scutula, *Karst.*
H. stigmarion, *Rehm.*
Peziza striata, *Nees.*
P. flavofuliginea, *A. and S.*
P. carpinea, *Fr.*
Hypoderma Lauri, *Duby.*
Lophium decipiens, *Karst.*
Lophodermium petiolicolum, *Fckl.*
Gnomonia errabunda, *Awd.*
Phelonitis strobilina, *Fr.*
Cladosporium fasciculare. *Fr.*
C. Martianoffianum, *Thum.*
C. diaphanum, *Thum.*
C. ampelinum. *Pass.*
Cercospora beticola, *Sacc.*
C. Solani, *Thum.*
C. Smilacis, *Thum.*
C. Thalictri, *Thum.*
C. acerina, *Hart.*
C. persica, *Sacc.*
C. Rhamni, *Fckl.*
C. Bupleuri, *Pass.*
Triposporium Juglandis, *Thum.*
Macrosporium Ravenelii, *Thum.*
M. diversisporium, *Thum.*
Fusicladium Aronici, *Sacc.*
F. dendriticum, *Wallr.*
F. orbiculatum, *Thum.*
F. pyrinum, *Bon.*
Dendryphium curtum, *B. & Br.*
Sporidesmium Macluræ. *Thum.*
Ramularia Hellebori. *Fckl.*
R. didyma, *Ung.*
R. Nemopanthis, *C. & P.*
Sporotrichum pulviniforme, *Thum.*
Isaria farinosa, *Fr.*
Fusisporium Buxi, *Fr.*
F. lacteum, *Desm.*
F. chenopodinum, *Thum.*
Cystispora foliicola, *Lib.*
C. Therryana, *Thum.*
Sphacelia segetum, *Lev.*
Glœosporium filicinum, *Rost.*
G. Sibiricum, *Thum.*
G. ampelophagum, *Sacc.*
G. affine, *Sacc.*
G. Robergei, *Desm.*
G. Pisi, *Oud*
G. paradoxum, *Sacc.*
G. sphaerelloides, *Sacc.*
Pestalozzia Planimi, *Vize.*
P. Acaciæ, *Thum.*
P. lignicola, *Cke.*
Diplodia carpinea, *Thum.*

Diplodia Incarvilleæ, *Thum.*
D. Henriquesii, *Thum.*
D. Molleriana, *Thum.*
D. fœniculina, *Thum.*
D. radiciperda, *Thum.*
Dothichiza Sorbi, *Lib.*
Micropera Pinastri, *Sacc.*
Phoma negundicola, *Thum.*
Aposphæria suffulta, *Thum.*
Asteromella vulgaris, *Thum.*
Phyllosticta Bolleana, *Thum.*
P. nuptialis, *Thum.*
Ascochyta Lactucæ, *Rostr.*
Septoria æsculina, *Thum.*
S. leguminum, *Desm.*
Myxosporium colliculosum, *Berk.*
Hendersonia Foueroyæ, *Thum.*
Henriquesia lusitanica, *P. & T.*
Heliscus Lugdunensis, *S. & T.*
Helminthosporium turcicum, *Pass.*
Fusarium globulosulum, *Pass.*
Fusidium stachydis, *Pass.*
Epidochium ambiens, *Desm.*
Botrytis cinerea, *Pers.*
Exosporium Rubi, *Nees.*
Penicillium glaucum, *Lk.*
Passalora bacilligera, *Fr.*
Stachybotrys lobulata, *Berk.*
Septosporium curvatum, *Rabh.*
Coniothecium didymum, *D. & M.*
C. Mollerianum, *Thum.*
Hydnum amicum, *Quel.*
H. septentrionale, *Fr.*
Irpex paradoxus, *Fr.*
Microcrassus candidus, *Cohn.*
Ectostroma Mulgedii, *Thum.*
E. Macluræ, *Thum.*

Prof. W. R. Dudley, Ithaca, N. Y.

Sisymbrium canescens, *Nutt.*
Draba arabisans, *Mx.*
Alyssum calycinum, *L.*
Hypericum Canadense, *L.*
Dianthus Armeria, *L.*
Trifolium hybridum, *L.*
Lespedeza Stuvei, *Nutt.*
Prunus pumila, *L.*
Poterium Canadense, *Gr.*
Agrimonia parviflora, *Ait.*
Rubus neglectus, *Pk.*
Cratægus coc. v. macracantha.
Potentilla recta, *Willd.*
P. fruticosa, *L.*
P. palustris, *Scop.*
Saxifraga aizoides, *L.*
Chærophyllum procumbens, *Lam.*
Lonicera hirsuta, *Eaton.*
L. oblongifolia, *Muhl.*
L. Xylosteum, *L.*
L. Tartarica, *L.*
Scabiosa australis, *Wulf.*
Tragopogon pratensis, *L.*
Polymnia Uvedalia, *L.*
Coreopsis discoidea, *T. & G.*
Pyrola sec. v. pumila, *Paine.*
Moneses uniflora, *Gr.*
Gerardia purpurea, *L.*
Lobelia Kalmii, *L.*
Calamintha acinos, *Clærv*
Onosmodium Carolinianum, *D. C.*
Amarantus blitoides, *Wats.*
Rumex Brittanica, *L.*
Quercus Muhlenbergii, *Engelm.*
Myrica Gale, *L.*
Naias major, *All.*
Sagittaria variabilis, *Engelm.*
Aplectrum hyemale, *Nutt.*
Spiranthes Romanzoviana, *Chapm.*
Iris pseudacorus, *L.*
Juncus alp. v. insignis, *Fr.*
Elocharis rostellata, *Torr.*
Scirpus Smithii, *Gr.*
S. planifolius, *Muhl.*
S. pauciflorus, *Lightf*
Carex Steudelli, *Kunth.*
C. tetanica, *Schk.*
C. Grayii, *Carey.*
C. hirta, *L.*
C. flaccosperma, *Dew.*
C. Hitchcockiana, *Dew.*
Oryzopsis Canadensis, *Torr.*
Aira cæspitosa, *L.*
Panicum virgatum, *L.*
P. hispidum, *Muhl.*
Eragrostis capillaris, *Nees.*
Botrychium simplex, *Hitch.*
B. matricariæfolium, *Braun.*
Ophioglossum vulgatum, *L.*
Isoetes Engel. v. gracilis, *Engelm.*
Azolla Caroliniana, *Willd.*

Clarence Lown, Poughkeepsie, N. Y.

Cheilanthes vestita, *Sw.*
Asplenium ebenoides, *Scott.*
Asplenium Bradleyi, *D. C. Eaton.*

(3.)

NEW STATIONS, REMARKS AND OBSERVATIONS.

The first thirteen species noticed are new to the Herbarium, the first eleven have not before been reported.

SISYMBRIUM CANESCENS, *Nutt.*

Watkins Glen, Schuyler county. *Professor W. R. Dudley.* In the manual, this plant is reported to have been found at Lucifer Falls, Tompkins county, by J. W. Chickering, but Prof. Dudley writes that he has searched for it in vain in that locality.

MALVA CRISPA, *L.*

Roadside, Petersburgh, Rensselaer county. Escaped from gardens and sparingly naturalized.

LYCHNIS DIURNA, *L.*

With the preceding species. Also escaped from gardens and door-yards.

LONICERA XYLOSTEUM, *L.*

South Hill near Ithaca. A single shrub was found growing in a pasture where there was an abundance of *Lonicera Tartarica,* L. *Dudley.* Both species have also been introduced about Albany where the latter also takes the lead in establishing itself.

SCABIOSA AUSTRALIS, *Wulf.*

Established about Union Springs, Cayuga county. *Dudley.*

CALAMINTHA ACINOS, *Clærv.*

Roadsides near Ithaca. Introduced. *Dudley.*

AMARANTUS BLITOIDES, *Wats.*

About Albany. *G. W. Clinton.* Union Springs and Frontenac Island, Cayuga lake. *Dudley.* Introduced from the West. In its foliage it resembles the very common *Amarantus albus,* but it has long prostrate spreading stems and branches and much larger seeds than that species.

IRIS PSEUDACORUS, *L.*

Near Ithaca. Also established in two localities in alluvial soil near Cayuga lake. *Dudley.*

CAREX HIRTA, *L.*

South Hill, Ithaca. Near the Delaware, Lackawana and Western railroad and apparently introduced. *Dudley.*

CAREX FLACCOSPERMA, *Dew.*

South Hill, Ithaca. *Dudley.* A stout form of *Carex laxiflora* var. *intermedia* sometimes occurs about Albany, which resembles this species in general aspect but it is readily distinguished from it by its much longer scales and different perigynia.

ASPLENIUM EBENOIDES, *R. R. Scott.*

Near Saugerties, Ulster county. Growing on limestone rocks in company with the walking fern, *Camptosorus rhizophyllus.* *C. Lown.* Mr. Lown had previously found a few specimens of this extremely rare fern about four miles south-east of Poughkeepsie. In this case as in all others it was associated with *Camptosorus rhizophyllus* and *Asplenium ebeneum,* the three growing within a foot of each other. In the Saugerties locality the *Asplenium ebeneum,* though present, was several feet distant.

SEDUM ACRE, *L.*

Roadside, Petersburgh. Escaped from cultivation and sparingly naturalized.

SAGITTARIA PUSILLA, *Nutt.*

In the New York Flora this species is recorded as occurring on "muddy banks of the Hudson where the water is brackish, as at West Point and Peekskill." The habitat attributed to it in the Manual is, "inundated shores, from eastern New Jersey and Philadelphia southward near the coast." It was recently detected by *Mr. H. N. Johnson* along the river shore at Coeymans, a few miles below Albany. This is a long distance from the usual stations of the plant and far above the reach of brackish water.

THALICTRUM ANEMONOIDES, *Mx.*

Coeymans. *Johnson.* This species manifests a strong disposition to produce double flowers. A few years ago Mr. Johnson took some of the plants from their native habitat and set them in his garden. The past season they developed double flowers. The exterior sepals are green and bract-like, but the inner, which are numerous, are white and petal-like. No stamens exist in any of the flowers and no pistils in some, thus indicating that the stamens have been transformed into petals.

ALYSSUM CALYCINUM, *L.*

University grounds, Ithaca. Introduced. *Dudley.*

DRABA ARABISANS, *Mx.*

Esty Glen and shore of Cayuga lake. *Dudley.*

LEPIDIUM CAMPESTRE, *L.*

Near Ithaca. *Dudley.* Also near Coeymans and rapidly spreading over the State.

LESPEDEZA STUVEI, *Nutt.*

Ithaca. *Dudley.*

RUBUS NEGLECTUS, *Pk.*

West shore of Cayuga lake. *Dudley.*

POTENTILLA RECTA, *Willd.*

Near Moravia. *Dudley.*

AGRIMONIA PARVIFLORA, *Ait.*

Freeville and Danby, Tompkins county. *Dudley.*

CRATÆGUS COCCINEA var. MACRACANTHA.

College campus, Ithaca and Union Springs. The thorns on the specimens are four to four and a half inches long.

PRUNUS PUMILA, *L.*

South Hill, Ithaca. *Dudley.* Some of the fruit is swollen into a pale, soft body, ovate or obovate in form and pointed at the apex. This is the result of an attack by a fungus, *Exoascus Pruni,* Fckl. This fungus also attacks the fruit of the wild plum, *Prunus Americana,* Marshall. I have also seen the fruit of our wild black cherry, *Prunus serotina,* swollen in a similar manner but the cause in this case was from an attack of an insect, the larvæ of which were found in the affected fruit.

SEDUM REFLEXUM, *L.*

Thoroughly established by the roadside near Newark, Wayne county. *E. L. Hankenson.*

EPILOBIUM MOLLE, *Torr.*

Sphagnous marsh in "Cheney's woods," near Glens Falls. *Mrs. L. A. Millington.* The specimens sent are young plants and they show at the base a dense cluster of very small thick subterranean scale-like leaves, which might easily be mistaken for a cluster of small tubers. They are arranged in pairs on opposite sides of the stem, as are the leaves, and they appear whitish, thick and starchy like cotyledonous leaves. Their office is apparently similar to that of cotyledonous leaves, that is, to store up nutriment upon which the plant can draw at some subsequent period of its existence. They do not appear upon the base of old plants or those which have flowered and fruited. They are also found at the base of young plants of *Epilobium palustre.*

LONICERA OBLONGIFOLIA, *Muhl.*

Michigan Hollow, near Danby. *Dudley.*

SAXIFRAGA AIZOIDES, *L.*

Cliffs of Taghanic ravine, near Ithaca, growing with *Primula Mistassinica* and *Pinguicula vulgaris. Dudley.*

CHÆROPHYLLUM PROCUMBENS, *Lam.*

In "Negundo woods," near Ithaca. *Dudley.*

MITCHELLA REPENS, *L.*

Near Moravia. *M. F. Merchant,* M. D. This is the form that produces white berries, concerning which Dr. Merchant writes, "I have observed them quite closely for nearly three years and have watched their flowering two seasons and their fruiting three. The flowers are not dimorphous in this patch, but are all of one form, all having long exserted stamens and short pistils. The fruit is copious and without any tendency to change or approach the red-fruited form. The plants are thrifty and spreading and there are none of the red-fruited plants in the immediate vicinity."

COREOPSIS DISCOIDEA, *T. & G.*

Shores of Dryden lake. *Dudley.*

LOBELIA KALMII, *L.*

Farley's Point, Cayuga lake, growing along the shores and in meadows. A variety with stout stem and large flowers. *Dudley.*

PYROLA SECUNDA var. PUMILA, *Paine.*

Deep moss in a fir-tree swamp near Freeville. *Dudley.*

CALYSTEGIA SEPIUM, *L.*

Tunis, Lewis county. *C. D. Hill.* The specimen differs from the ordinary form of the plant in having the stem pubescent, the leaves narrow and the flower tube very short. The flowers appear as if they were double, but in their dried and pressed condition this appearance may be deceptive.

RUMEX BRITANNICA, *L.*

Shores of Owasco lake inlet. *Dudley.*

COREMA CONRADII, *Torr.*

Shawangunk mountains, Ulster county. *C. E. Smith.* Long Island is the only locality in the State from which this pretty little evergreen heath-like shrub has previously been reported. Judging from the localities usually ascribed to it in the manuals, this new station is much farther inland than the plant usually occurs. Its presence here gives an additional botanical interest to the Shawangunk mountains which have already furnished several very rare and interesting species of plants.

QUERCUS MUHLENBERGII, *Engelm.* (*Q. castanea*, Muhl.)

"Big Gully" near Union Springs. *Dudley.* This is the *Q. Prinus* var. *acuminata* of the Manual, *Q. acuminata*, Mx., but it is regarded by Dr. Engelmann as quite distinct from *Q. Prinus.* It is a rare species in our State, its proper home being, according to Dr. Engelmann, in the Mississippi valley. In the New York Flora it is attributed to Chemung county on the authority of Dr. Knieskern. There are two forms of it; one having lanceolate narrow leaves, five to six inches long and one and a half to two inches broad, with acuminate apex and sharp teeth; the other having broadly ovate or obovate leaves, six or seven inches long and four or five inches broad, with broader and more rounded teeth. Our specimens belong to the narrow-leaved form.

MYRICA GALE, *L.*

Locke pond, Cayuga county. *Dudley.*

SAGITTARIA VARIABILIS var. HASTATA, *Engelm.*

Summit marsh, Spencer, Tioga county. *Dudley.* The specimen shows long linear and lanceolate phyllodia; also stolons giving rise to young plants. The variations in this well-named Sagittaria are exceedingly numerous. Specimens collected at Coeymans have the leaves of variety *latifolia,* but all the flowers staminate on some plants, thus passing to the diœcious inflorescence of variety *obtusa.* Specimens of variety *gracilis* from the same place have, in some cases, all the leaves without lobes, in others some leaves are lobed, others, lobeless. A specimen of this variety from Long lake has the fruiting heads almost sessile, as in *S. heterophylla.* Specimens of variety *hastata* and variety *angustifolia* also sometimes occur with diœcious inflorescence.

NAIAS MAJOR, *All.*

Foot of Cayuga lake. A slender form with long internodes and long narrow leaves. Black lake, a shallow pond four miles below Cayuga lake. A short, stout, dark or purplish-colored leafy form with dichotomous recurved habit and slightly curved and more distinctly reticulated fruit. *Dudley.*

APLECTRUM HYEMALE, *Nutt.*

West Dryden. *Dudley.*

SCIRPUS SMITHII, *Gr.*

Shore of Cayuga lake, near Union Springs. *Dudley.*

CAREX STEUDELII, *Kunth.*

Six-mile creek, near Ithaca. *Dudley.*

ERAGROSTIS PURSHII, *Schrad.*

Waste places about Albany. *Clinton.* This southern grass is rapidly extending its range northward. Last year it was reported from Yonkers, this year it appears to be well established at Albany. It appears, like many other introduced plants, to follow the lines of the railroads which are a powerful agency in extending the distribution and range of species and in intermingling the floras of different localities. This grass closely resembles its congener, *E. pilosa,* from which it is most readily distinguished by the naked axils of its panicle.

ERAGROSTIS CAPILLARIS, *Nees.*

Ithaca. *Dudley.* A dwarf form three or four inches high.

CHEILANTHES VESTITA, *Sw.*

Two miles below Poughkeepsie on the east side of the river. It occurs also on the west side of the river, but in blasting the rocks for the West Shore railroad, its station may have been destroyed. *C. Lown.*

ASPLENIUM BRADLEYI, *D. C. Eaton.*

Shawangunk mountains, Ulster county. *Lown*

BOTRYCHIUM SIMPLEX, *Hitch.*

Danby. *Dudley.* The specimens are well developed and belong to the varieties *incisum* and *subcompositum.*

BOTRYCHIUM MATRICARIÆFOLIUM, *A. Braun.*

McLean, Tompkins county. *Dudley.* Both these species and the more rare *B. lanceolatum,* Angst., occur in Petersburgh, Rensselaer county, growing together.

ISOETES ENGLEMANNI var. GRACILIS, *Engelm.*

Locke pond. *Dudley.*

AZOLLA CAROLINIANA, *Willd.*

Foot of Cayuga lake. *Dudley.* Sodus bay. *Hankenson.* The Cayuga lake specimens are much more dense and compact in habit than the Sodus bay specimens.

(4.)

NEW YORK SPECIES OF PSALLIOTA.

"Stem annulate, distinct from the hymenophorum; lamellæ free." *Hymen, Europ.*, p. 278.

The name of the subgenus Psalliota is derived from the Greek word Ψαλλιον (Ψελλιον), a bracelet or armlet. Its application to these Agarics was probably suggested by the annulus or ring which encircles the stem. The species of this subgenus correspond in structure to those of the subgenus Lepiota in the Leucospori or white-spore series and to those of the subgenus Annularia in the Hyporhodii or pink-spore series. The tendency of the flesh in some species of Psalliota to change color when cut or bruised corresponds also to a similar tendency in some of the Lepiotæ. No corresponding subgenus has yet been established in the Dermini or ochraceous-spore series, nor in the Coprinarii or black-spore series. The Agarics belonging to the subgenus Psalliota are generally of medium or large size and rather attractive in appearance until the lamellæ have assumed the blackish color of age. They are most abundant in late summer or autumn, but in warm wet weather some of them occur early in the season also. The pileus is more or less fleshy but usually rather brittle or easily broken. It may be either smooth, fibrillose or scaly. Sometimes even individuals of the same species exhibit pilei with all these characters. The fibrillose pileus of a young individual may become either smooth or scaly with age. No species having a viscid pileus appears yet to have occurred either in our State or in Europe, though an Ohio species *A. fabaceus*, Berk., is described as having the pileus viscid when moist. The lamellæ are generally close or crowded and rounded at their inner extremity and not attached to the stem. They change color with advancing age, becoming darker as they grow older. This change of color is in great measure due to the development of the spores which cause the lamellæ to assume their own brown or blackish-brown hue. The lamellæ of young plants are generally whitish or pallid, changing in some species, directly from this color to the brown color of maturity, and in others, assuming an intervening pinkish rosy or reddish hue before taking on the final dark or sombre color. The exceptional *A. fabaceus* is described as having the lamellæ brown even in the young plant, but even in this case they are said to become darker with age. In the common mushroom, *A. campestris*, they may become moist or subdeliquescent when old, thus indicating a relationship with the inky species of the genus Coprinus. The stem is fleshy and furnished with an annulus or ring, which in some species varies in its degree of development, and in others is more or less thin and somewhat evanescent. The spores in our species are quite small, elliptical or subelliptical in outline and do not vary greatly in dimensions in the different species.

Fries groups the European species in two sections which he names "Edules," and "Minores." The former group includes the larger and more fleshy species. Several of them are edible and have long been used as an article of food. No representatives of the "Minores" have yet been found in our State. Of the "Edules" we have several species which may again be divided into two sub-groups depending on their usual habitats. Those which grow in open places, manured grounds or cultivated fields generally have a thicker, firmer pileus and a comparatively shorter stouter stem than those that grow in copses groves and woods. It is among these especially that the most notable succulent "mushrooms" are found.

SYNOPTICAL TABLE OF THE SPECIES.

Growing in fields, open places or cultivated grounds	2
2. Lamellæ at first whitish or pallid	3
2. Lamellæ at first pinkish or flesh colored	A. campestris.
3. Lamellæ narrow, stem solid	A. Rodmani.
3. Lamellæ broader, stem stuffed or hollow	A. arvensis.
1. Growing in woods, copses or groves	4
4. Stem bulbous	5
4. Stem not bulbous	6
5. Pileus smooth	A. silvicola.
5. Pileus squamulose	A. placomyces.
6. Pileus two inches or more in diameter	A. silvaticus.
6. Pileus less than two inches in diameter	A. diminutivus.

AGARICUS CAMPESTRIS, *L.*

Common Mushroom. Edible Mushroom. Field Agaric.

Pileus at first hemispherical or convex, then expanded with decurved margin or nearly plane, smooth silky floccose or hairy squamulose, the margin extending beyond the lamellæ, the flesh rather thick, firm, white; lamellæ free, close, ventricose, *at first delicate pink or flesh color,* then blackish-brown, *subdeliquescent;* stem equal or slightly thickened toward the base, *stuffed,* white or whitish, nearly or quite smooth; annulus at or near the middle, more or less lacerated, sometimes evanescent; spores elliptical, .00025 to .0003 in. long, .00016 to 0002 in. broad.

Plant 2 to 4 in. high, pileus 1.5 to 4 in. or more broad, stem 4 to 8 lines thick.

Fields, pastures, manured grounds, mushroom beds, etc.

This is the well-known "edible mushroom," a species which is more extensively cultivated and more generally used as food than any other. With proper attention to its characteristic features there is no need of its being mistaken for or confused with any deleterious or poisonous species.

The pileus is nearly always regular in shape, rather thick and moderately firm, hemispherical or convex when young but usually becoming more flattened or nearly plane with age.

In its young state it is adorned with fine silky or hairy fibrils which sometimes, with advancing age, form minute persistent tufts or scales and sometimes disappear altogether, leaving the surface quite smooth. The decurved margin usually extends a little beyond the extremity of the lamellæ. The cuticle or skin is more or less readily separable from the flesh, which is white, but sometimes manifests a tendency to change color slightly when cut or bruised, and to exhibit pinkish or reddish stains. The color of the pileus in the wild form is usually white or whitish with us, but in the cultivated forms it is often ochrey-brown or pale tawny, and varieties sometimes occur in which it is brown.

The lamellæ have a very beautiful and delicate pinkish hue which is apparent as soon as they are exposed to the light by the separation of the concealing veil from the margin of the pileus. This color gradually becomes darker with advancing age until it finally changes to a dark brown or almost black hue. This character is one of the best by which to distinguish the "edible mushroom" from all other Agarics, except its nearest allies, *A. Rodmani* and *A. arvensis.* And even from these, when young, it may readily be distinguished by the primary color of its lamellæ. The subgenera Annularia and Pluteus in the pink-spore series contain species the lamellæ of which exhibit similar pinkish colors, but these never change to brown or blackish-brown as the plant matures or becomes old. In the mushroom the lamellæ are rounded at their inner extremity and not attached to the stem, so that generally in mature specimens there is a small free space between it and them.

The stem is commonly short in proportion to the breadth of the pileus, its length being, in most cases, less than the horizontal diameter of the pileus. Ordinarily it is cylindrical in shape, though now and then instances occur in which it may either be slightly thickened or slightly narrowed toward the base. The central portion of the stem is a little softer in texture than the external portion, hence it is said to be stuffed. The annulus encircles it at or near the middle. It is sometimes quite thin and flabby and is then easily torn and destroyed.

The mushroom, like many other plants which have been the subject of long and extensive cultivation, has given rise to several forms which exhibit quite marked distinctive features. These forms differ so much from the original typical form that they have received distinguishing names and are called varieties. The following are the principal ones.

Var. *albus.* White variety. Pileus smooth or slightly silky-fibrillose, white or whitish, stem short.

This is our most common variety. It occurs in unfrequented streets, waste places, cultivated grounds and especially in rich pastures where the grass is kept short. It usually appears in August and September, but sometimes in warm, wet weather it is found early in the season. A very large form with the pileus six or seven inches broad sometimes occurs.

Var. *praticola.* Meadow variety. (A. praticola, *Vitt.*) (A. pratensis, *Handbook.*) Pileus adorned with reddish scales, flesh somewhat tinged with pink. This variety must be uncommon with us. I have seen no examples of it, nor of the three following varieties :

Var. *umbrinus.* Brown variety. Pileus smooth, brown ; stem stout and minutely scaly.

Var. *rufescens.* Reddish variety. Pileus reddish, minutely scaly; lamellæ at first white ; stem elongated ; flesh turning bright red when cut or bruised. This departs so decidedly from the ordinary characters of the type, especially in the white color of the young lamellæ, that it seems to merit separation as a distinct species.

Var. *villaticus.* Villa variety. (A. villaticus, *Brond.*) Plant large, pileus scaly ; stem scaly, coated or subvolvate by the inferior veil. In the Handbook of British Fungi this is placed as a variety of *A. arvensis,* but most authors regard it as a variety of *A. campestris.*

Var. *hortensis.* Garden variety. Pileus brownish or ochrey-brown, bearing hairy fibrils or minute scales. This is often cultivated and is occasionally exposed for sale in the markets of Albany.

Var. *Buchanani.* Buchanan's variety. Pileus white, smooth, depressed in the center, the margin naked ; stem stout ; annulus thin, lacerated. A rare variety sometimes occurring in mushroom beds.

Var. *elongatus.* Long-stem variety. Pileus small, smooth, convex, the margin adorned with the adherent remains of the lacerated veil ; stem long, slender, slightly thickened toward the base ; annulus slight or evanescent. This is also a variety of mushroom beds.

Var. *vaporarius.* Green-house variety. (A. vaporarius, *Vitt.*) Pileus brownish, coated with long hairs or fibrils ; stem hairy-fibrillose, becoming transversely scaly. Conservatories, cellars, etc. Not differing greatly from Var. *hortensis.*

AGARICUS RODMANI, *Pk.*

Rodman's Mushroom.

Pileus rather thick, firm, at first convex, then nearly or quite plane, with decurved margin, smooth or rarely slightly rimose-squamose on the disk, white or whitish, becoming yellowish or subochraceous on the disk, the flesh white, unchangeable ; lamellæ close, *narrow*, rounded behind, free, reaching nearly or quite to the stem *at first whitish, then pink or reddish-pink*, finally blackish-brown; stem short, subequal, *solid*, whitish, smooth below the annulus, often furfuraceous or slightly mealy-squamulose above; annulus variable, thick or thin, entire or lacerated, at or below the middle of the stem ; spores broadly elliptical or subglobose, generally uninucleate, .0002 to .00025 in. long, .00016 to .0002 in. broad.

Plant 2 to 3 in. high; pileus 2 to 4 in. broad; stem 6 to 10 lines thick.

Grassy ground and paved gutters. Astoria, Long Island. *Rev. W. Rodman.* Washington Park, Albany. May to July.

This species is intermediate between *A. campestris* and *A. arvensis*, from both of which it may be distinguished by its narrow lamellæ, solid stem and smaller, almost globose, spores. In size, shape of the pileus and general appearance it most resembles *A. campestris*, but in the whitish primary color of the lamellæ and in the yellowish tints which the pileus often assumes, it approaches nearer to *A. arvensis.* The pileus, which is usually smooth, occasionally manifests a tendency to crack into small areas or scales on the disk. The flesh is quite thick and firm, its thickness generally much exceeding the breadth of the lamellæ. This character, together with the solidity of the stem, indicates a disposition in the species to produce flesh rather than fruit and may make it more desirable for cultivation than the common mushroom. The length of the stem, in all the specimens I have seen, is less than the breadth of the pileus. Its shape is nearly cylindrical. The annulus is generally rather thick and sometimes projects both above and below in such a manner that it appears like a grooved band or collar surrounding the stem. In some instances it is so near the base that it suggests the idea of a volva. Its lower or exterior surface is occasionally rimose, thereby indicating another point of resemblance between this species and *A. arvensis.* In this respect, as well as in its solid stem and narrow lamellæ, it also approaches *A. augustus*, a large and showy European species which has not yet occurred with us, but which may be known by its lamellæ changing at once from the pallid color of immaturity to the dark-brown hue of age, without exhibiting any intervening pinkish tints.

The species is respectfully dedicated to its discoverer. Its edible qualities are deemed equal to those of the common edible mushroom. It has been tested by Mr. G. Rodman. It is apparently a rare species, but may be more common than is supposed, for it may possibly have been heretofore confused with the common mushroom, which it much resembles in color, the pileus being at first white or whitish, although it soon assumes yellowish tints or becomes a pale ochrey-red or russet color on the disk.

AGARICUS ARVENSIS, *Schæff.*

Horse Mushroom. Plowed-land Mushroom.

Pileus at first convex or conical-campanulate, then expanded, at first more or less floccose or mealy, then smooth, white or yellowish, flesh white; lamellæ close, free, generally broader anteriorly, *at first whitish, then pinkish,* finally blackish-brown; stem equal or slightly thickened toward the base, smooth, *hollow or stuffed* with a floccose pith; annulus rather large, thick, the lower or exterior surface often cracked in a radiate manner; spores elliptical, .0003 to .0004 in. long, .0002 to .00025 in. broad.

Plant 2 to 5 in. high; pileus 3 to 5 in. or more broad; stem 4 to 10 lines thick.

Cultivated fields and pastures. Summer and autumn.

This species is so closely related to the common mushroom that it is regarded by some authors as a mere variety of it. Even the renowned Persoon is said to have written concerning it, "It appears to be only a variety of *A. campestris.*" Cordier says of it, "Distinguished from *A. campestris* by its pure white color, more pale lamellæ, its white flesh not changing color when cut or bruised, its lamellæ remaining pale a long time and not deliquescing." Fries also says that it is commonly not distinguished from *A. campestris,* but that it is diverse in some respects; its white flesh being unchangeable, its lamellæ never deliquescing, remaining a long time pale and not becoming dark red in middle age. Berkeley says of it, "A coarse, but wholesome species, often turning yellow when bruised."

In size the horse mushroom often exceeds the common mushroom, its pileus, according to the Handbook, sometimes attaining a breadth of eighteen inches and its stem a thickness of one to two inches. The white color of the pileus often becomes tinged with yellow, either with age or in drying. The pale primary color of the lamellæ, the thick, well-developed annulus and the hollow stem are available features for distinguishing it from its close allies. It is less common with us than *A. campestris,* to which in edible qualities it is very similar. A. Georgii, *Sow.*, A. pratensis, *Scop.*, A. edulis, *Krombh.*, and A. exquisitus, *Vitt.*, are synonyms.

AGARICUS SILVICOLA, *Vitt.*

Silvan Mushroom.

Pileus convex or subcampanulate, sometimes expanded or nearly plane, *smooth, shining,* white or yellowish; lamellæ close, thin, free, rounded behind, generally narrowed toward each end, *at first whitish, then pinkish,* finally blackish-brown; *stem long,* cylindrical, stuffed or hollow, white, *bulbous;* annulus either thick or thin, entire or lacerated; spores elliptical, .00025 to .00032 in. long, .00016 to .0002 in. broad.

Plant 4 to 6 in. high; pileus 3 to 6 in. broad; stem 4 to 8 lines thick.

Woods, copses and groves or along their borders. Summer and autumn.

Many authors place this as a variety of *A. campestris,* but as it occurs with us its characters are very constant and well marked and enable it to be distinguished from that species with great facility. It generally attains a larger size, has a smoother, more shining pileus, which is usually tinged with yellow, it has the primary color of the lamellæ whitish, and its stem is longer and proportionately more slender and distinctly bulbous. It has, as Fries suggests, more points of resemblance to *A. arvensis* than to *A. campestris,* but its bulbous stem at once separates it from that species. The bulb is peculiar, it being small but very abrupt and depressed or flattened like a common turnip. The pileus is thin in proportion to its breadth and is quite fragile, so that the plants must be handled with care to prevent its being broken. In mature plants the margin of the pileus sometimes has a lurid or dull purplish tint, which is probably derived from the color of the spores.

The annulus is often tinged with yellow exteriorly and is sometimes radiately rimose on the lower surface like that of *A. arvensis.* In some instances fragments of it remain attached to the margin of the pileus. The plants sometimes grow in close groups or tuft-like clusters. *A. edulis,* Berk., is given as a synonym.

It is reported to be esculent, but I have not tested it. Persons unacquainted with it should guard against confounding immature specimens of it with the white forms of the phalloid agaric, *A. phalloides,* a poisonous species which grows in similar places and bears some resemblance to it. The poisonous *A. phalloides* has a much larger bulb to the stem and the lamellæ remain permanently white or whitish, showing at no age either the pinkish or blackish-brown hues which are so conspicuous in *A. silvicola.*

AGARICUS PLACOMYCES, *Pk.*

Flat-cap Agaric.

Pileus fleshy but rather thin, at first convex or campanulate, then expanded and quite plane, *squamulose,* whitish, *the disc and minute scales brown ;* lamellæ close, free, *white, then pinkish,* finally blackish-brown; stem smooth, stuffed with a small pith slightly tapering upward, *bulbous,* whitish, the bulb stained with yellow and usually giving rise to one or two mycelioid white root-like processes; annulus large, flabby; spores elliptical, .0002 to .00025 in. long, .00016 to .00018 in. broad.

Plant 3 to 5 in. high, pileus 2 to 4 in. broad, stem 2 to 4 lines thick.

Under hemlock trees. Oneida and Knowersville. July.

This rare but beautiful Agaric is easily distinguished from its allies by the bulbous stem and the perfectly flat white surface of the expanded pileus finely adorned by numerous minute brown scales. These scales are confluent on the disk where they form a brown spot, thus imitating in appearance many species of the subgenus Lepiota. Sometimes faint radiating striæ extend from the disk to the margin of the pileus. In damp weather the large thin annulus is sometimes studded with drops of moisture of a dark color. Nothing is known concerning the edible qualities of the species. The specific name is derived from two Greek words, *πλακους*, a flat cake, and *μυκης*, a fungus, and has reference to the very flat horizontally expanded pileus.

AGARICUS SILVATICUS, *Schæff.*

Wood Agaric.

Pileus thin, at first convex or campanulate, then expanded, *gibbous or subumbonate,* fibrillose or variegated with a few thin tawny brownish or reddish-brown *spot-like appressed scales,* whitish, brownish or smoky gray, the disk sometimes tinged with red or reddish-brown, the flesh white or faintly reddish ; lamellæ thin, close, free, narrowed toward each end, reddish, then blackish-brown ; stem rather long, *equal or slightly tapering upward,* hollow, whitish ; spores elliptical, .0002 to .00025 in. long, .00016 to .0002 in. broad.

Plant 3 to 5 in. high, pileus 2 to 4 in. broad, stem 4 to 6 lines thick.

Woods. Summer and autumn. Not common.

The absence of a bulbous base to the stem and the fibrillose or feebly scaly pileus which is more or less gibbous or umbonate, serve to distinguish this from the two preceding species. Concerning its edibility, Cordier says that it is at least suspicious and that Vivian pronounces it "pernicious." Its odor is strong and its flesh when cut assumes a slight yellowish tint.

AGARICUS DIMINUTIVUS, *Pk.*

Diminutive Agaric.

Pileus thin, fragile, at first convex, then plane or centrally depressed, sometimes slightly umbonate, whitish or alutaceous, faintly spotted with small thin silky appressed brownish scales,the disk brownish or reddish-brown ; lamellæ close, thin, free, ventricose, brownish-pink becoming brown, blackish-brown or black ; stem equal or slightly tapering upward, stuffed or hollow, smooth, pallid ; annulus thin, persistent, white; spores elliptical, .0002 in. long, .00015 to .00016 in. broad.

Plant 1.5 to 2 in. high, pileus 1 to 1.5 in. broad, stem 1 to 2 lines thick.

Woods. Croghan and Sandlake. Autumn.

This is a small but symmetrical and beautiful Agaric. It is perhaps too closely related to the preceding species of which it may possibly prove to be a mere variety or dwarf form. Its pileus is quite thin and fragile. Usually the darker or reddish hue of the disk gradually loses itself in the paler color of the margin, but sometimes the whole surface is tinged with red.

In closing this brief report my most cordial thanks are tendered to those botanists who have aided me by contributing specimens and information, and their continued co-operation in the work now well advanced is most earnestly solicited.

Respectfully submitted,
CHAS. H. PECK.

ALBANY, *January* 8, 1883.

SOME ABNORMAL AND PATHOLOGIC FORMS OF FRESH-WATER SHELLS FROM THE VICINITY OF ALBANY, NEW YORK.

BY CHARLES E. BEECHER.

Monstrosities among fresh-water shells are not infrequent and are interesting as illustrative of the cause of natural or accidental deformity. A large proportion of abnormal or pathologic forms is found in exposed situations, where the shells are subject to varying conditions of water and materials brought by currents or otherwise. The annual draining and cleaning of the canals renders the contained organisms liable to many accidents. It is likewise found that in the vicinity of a ford or watering-place for cattle, many of the uniones bear the marks of injury. It is, while the animal is repairing these injuries and adapting itself to changing conditions of water and deposits, that most of the malformations in its shell are produced, and it is quite seldom that a shell is found which has been deformed by the atrophy or hypertrophy of any of the animal organs. These malformations are occasionally transmitted and their degree is often augmented by the action of the law of accelerated heredity, as applied to the mollusca by Professor Alpheus Hyatt.*

It is convenient to consider abnormalities as natural or accidental. Natural changes are usually produced by the action of gravitation, adaptation to modified habitats or by changes in the forms of the organs. The effects of gravitation are noticed mainly in those univalves which live at or near the surface of the water and, therefore, necessarily carry the weight of the shell at a disadvantage.

Accidental deformities are always the accompaniment of an attempt by the animal to repair injuries which it has received. If the form of the shell has been altered, the animal will accommodate itself to this alteration ; and, on the contrary, if permanent injury or malformation has been produced in the soft parts of the animal, the accreting test will gradually adjust itself to this change in those parts.

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* The Genesis of the Tertiary Species at Steinheim, by Alpheus Hyatt; page 27, Anniversary Memoirs of the Boston Society of Natural History, 1880.

One of the most noticeable and interesting examples of a departure from normal conditions is sinistrality. With some genera and species (Partula, Achatinella, Bulimus, etc.) the dextral or sinistral shells occur indifferently. Thus, from a sinistral specimen of *Campeloma,* Raf. (*Melantho,* Bodw.) were taken two sinistral fry. The remaining twenty-five were dextral. Also, some of the fry of dextral individuals are very often sinistral. In other genera only certain (*supra*) species are sinistral, and again in some entire genera (Physa, Clausilia, etc.) this is a constant feature. Many genera and species have not yet furnished a single example. Two remarkable sinistral forms are given in the present paper. Several others, among our land and fresh-water shells, are known from the State of New York, but not in the vicinity of Albany. Individuals are found among our uniones which have the cardinal and lateral teeth interchanged in the valves, thus giving to the right valve the form and number of teeth belonging to the left. This kind of sinistrality is of unusual occurrence, and has been rarely noticed.

Upon the authority of Professor R. Ellsworth Call, I am able to cite the following species in which he has observed the above reversion of teeth: *Unio complanatus,* Mohawk, N. Y.; *U. rubiginosus,* Des Moines, Iowa, and *U. cahawbensis,* Cahawba river, Alabama. He has also had the kindness to make several valuable suggestions and corrections in the subject matter of the present paper.

DESCRIPTION OF SPECIMENS.

PHYSA ANCILLARIA, *Say.*

Plate I, figs. 6–8.

Figure 6 represents a specimen with an unusually expanded aperture. The first thickening of the labrum is immediately succeeded by another thickening of the margin, which is also flexed outward and produces the enlargement.

The second specimen, figure 7, exhibits the tendency of the outer volution to become free. The suture is very deeply impressed nearly to the columella, and the aperture is much shortened.

These two specimens exhibit natural departures, while figure 8 represents an accidental deformity, in which the margin of the aperture is deeply excavate and the lower part of the labrum is sinuate.

PLANORBIS EXACUTUS, *Say*.

Plate I, figs. 1–3.

The examination of a large series of specimens from the vicinity of Albany shows that this species frequently departs from its normal form. Individuals with expanded and variously modified apertures are not uncommon and one sinistral example has been detected.

Figure 1 represents an individual in which the upper side of the labrum is expanded.

Figure 2 represents an individual in which the entire aperture is inflated, especially on the lower side.

The sinistral specimen (figure 3) has lost nearly all the testaceous characters belonging to the species and is a monstrosity in every particular. It is impossible to determine from external evidence whether it is a case of true sinistrality or one of inverted growth. The volutions are of equal convexity on either side and the obliquity of the aperture is not determinative. The specimen was found in a locality abounding only in this species, and the three specimens here described were selected from among several thousand others, about two per cent of which show some departure from normality, principally in variations in the form of the aperture and elevation of the spire and in intermittent growth.

VALVATA TRICARINATA, *Say*.

Plate I, fig. 9.

The volutions of the specimen are free except at the apex. This variation in this species has been recorded by several observers and is not extremely rare, although this is the only specimen which has been found in the vicinity of Albany.

GILLIA ALTILIS, *Lea*.

Plate I, fig. 5.

A very remarkable biflexed individual. The shell, for a considerable period of its growth, equal to the formation of the three initial volutions, is dextral and of the usual form. The spiral then changes its direction; the apex becomes partially inverted and the last volution is sinistral. This is the only example of a heterospiral growth that is known to me and cannot be satisfactorily accounted for from the appearance of the shell alone. An examination of the anatomy of the animal might have revealed the cause of this reversion of growth. The initial point of the operculum being nearer to the apex of the shell, indicates that the growth was inverted during the formation of the last volution, and suggests, as a possible explanation, the action of gravitation on an animal too weak to hold the shell on its dorsum.

SOMATOGYRUS SUBGLOBOSUS, *Say*.

Plate I, fig. 4.

The carination of the volutions and narrowing of the upper part of the aperture is often observed in individuals of this species. The specimen figured is an extreme development in these particulars, and presents a marked departure from the usual form.

UNIO PRESSUS, *Lea*.

Plate I, figs. 10–12.

Figure 10 represents the left side of a specimen which is unusually alate at the post-cardinal extremity. The outer zone of growth slopes rapidly to the pallial margin and is marked by the absence of the colored radii. In the specimen the body of the shell is of a dark-green color, while the last annulus of growth is yellow and presents a strong contrast with the remaining portion of the shell.

The next figure (figure 11) represents a specimen which received an injury during the early growth of the shell. The margin of the valve is flexed and there is a broad mesial depression in the right valve extending from the umbo to the margin. In the left valve the conditions are reversed, the depression in the right valve being represented by a corresponding plication.

Figure 12 shows a left valve with the anterior portion narrow and auriculate, the umbo oblique and the wing much reduced. The teeth of this specimen are also much modified; in the left valve there is a single continuous elevated tooth which is sinuate anteriorly to represent the cardinal teeth. In the right valve the teeth are quite rudimentary and the strong cardinal ridge of the opposite valve projects into the rostral cavity.

UNIO CARIOSUS, *Say*.

Plate I, fig. 13.

The figure represents a small gibbous female with the anterior end unusually narrowed. Individuals of a similar character are not unusual, although they are seldom as ventricose as in the present instance.

UNIO NASUTUS, *Say*.

Plate II, fig. 1.

A female showing a row of seven vertical plications on the zone of growth adjacent to the last, with obscure traces of similar plications made at an earlier period of development.

UNIO COMPLANATUS, *Solander.*

Plate II, figs. 2–6.

Figure 2 represents a specimen similar to the preceding, but with more numerous and stronger vertical plications. The shell in these species is normally smooth and we must seek for an explanation of the cause of the plications in the soft parts of the animal, as they are evidently not due to accidental causes. From the examination of a number of individuals presenting these plications in various degrees of prominence, and from the inspection of the living animal, it is evident that these abnormal features are produced by the rapid growth of the shell over the gills while they are distended with fry. *Unio osbeckii*, a species from China, is classed with the plicate forms in Lea's *Synopsis of the Unionidæ*, but the plications do not seem to be a constant characteristic of the species. The plications are not always present and, when they do occur, they are usually obscure and similar in position and expression to those specimens of *U. nasutus* and *U. complanatus* here presented and probably have a like significance.

Figure 3 represents the right valve of a specimen modified by accidental deformity. The umbo is nearly central, and the upper anterior portion of the valve is flattened and deeply sulcate.

The next specimen (figs. 4, 5) is a very elongate cylindrical form with an excessively thickened pallial margin.

The last individual to be noted (fig. 6) is an apparently normal form, as no marks of accidental or natural deformity can be detected. It was found associated with numerous specimens of *U. complanatus*, and is here referred to this species, although seemingly presenting marked specific differences. The outline is regularly elliptical, and the prominent beak is situated just anterior to the middle of the length. The cardinal teeth are elongate, and the lateral tooth is short and oblique — characters which do not belong to *U. complanatus*. Should it ultimately prove of a distinct species, it would be of a form hitherto unknown to this locality.

Specimens similar to the preceding briefly noted forms are often overlooked or considered as unimportant by many collectors ; but to a student of morphological variation and possible specific change, they are extremely interesting. After numerous accidental and natural changes have been illustrated and described, embracing many genera and species, it will be possible to generalize important biological facts relating to the classification of species and manner of growth of the organisms.

BRYOZOA

(FENESTELLIDÆ)

OF THE

HAMILTON GROUP.*

By JAMES HALL.

FENESTELLA MULTIPLEX, *n. sp.*

Bryozoan, occurring only in fragments; the shape of the frond is uncertain, but probably is infundibuliform; fragments of six centimetres in width occur, evidently only a small portion of the whole frond.

Branches moderately strong, enlarging below the bifurcations, and the width just above bifurcation is .33 mm., below bifurcation .66 mm. or slightly less. The distance between the branches is variable; there are on different portions of the frond five or six branches in the space of five millimetres; on non-poriferous side the branches are angular, and have along the middle a slight keel or carina, which connects with a similar carina on the dissepiments; when the dissepiments on opposite sides of a branch are alternating, the carina of the branch, in connecting with the carina of the dissepiment, becomes zigzag, which causes the branches to appear more irregular and less rigid than on the poriferous side; the branches are smooth.

Dissepiments about .25 mm. in diameter, four in the space of five millimetres; on non-poriferous side slightly depressed, angular and carinated; on poriferous side, depressed, rounded.

Fenestrules, on non-poriferous side, subquadrangular in outline; on poriferous side oval; length about one millimetre, width varying from one-third to two-thirds the length.

Cells in from two to four ranges, occurring as follows: In a branch which from commencement to bifurcation is six millimetres in length, for one millimetre only two ranges of cells occur, three ranges for the space of three millimetres, and for the remaining two millimetres four ranges of cell apertures. Cells minute, circular, about .12 mm. in diameter, distant from each other equal to the diameter of an aperture, twenty in the space of one millimetre, four in the space of one fenestrule, counting those opposite the dissepiment; margins distinctly elevated, and those of the outer rows indenting the border of the fenestrule; apertures sometimes alternating and forming oblique transverse rows, at other times irregularly arranged; where two rows occur the apertures open directly upward; where three or four rows occur the central row or rows open directly upward, and the two outer rows laterally; space between rows of apertures smooth.

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* The species of the present paper only partially represent the genus as occurring in the Hamilton group. It is published in this incomplete form in order to show the progress of the work upon the Bryozoans, and to facilitate the final revision of the species.

Formation and localities. Hamilton group; Moscow, Livingston county, and Alden, Erie county, N. Y.

FENESTELLA LATITRUNCATA, *n. sp.*

Bryozoan, occurring only in fragments; the form of frond is not certainly known, but probably is infundibuliform.

Branches strong, gradually enlarging to the bifurcations; width just below bifurcation one and one-third millimetres, just above, two-thirds to three-fourths of one millimetre; the distance between the branches is from one-half to four-fifths of one millimetre; three to four branches in the space of five millimetres; on non-poriferous side the branches are slightly angular.

Dissepiments about .5 mm. in diameter, slightly expanding at their junction with the branches, two in the space of five millimetres; on non-poriferous side, on a plane with the branches, slightly arching and angular; on poriferous side slightly depressed, rounded.

Fenestrules, on non-poriferous side, subquadrangular; on poriferous side oval, in outline; length one and three-fourths millimetres.

Cells arranged in from three to six ranges; cell apertures minute, circular .14 mm. in diameter, distant from each other a little more than the diameter of an aperture, sixteen in the space of five millimetres longitudinally; margins distinctly elevated, and those of the outer rows indenting the border of the fenestrules, so much so, that the margins are plainly visible from the non-poriferous side, giving a somewhat serrate appearance to the margin, alternating and forming oblique, transverse rows; the longitudinal rows are separated by a fine, slightly elevated carina; the space between the apertures, longitudinally, has sometimes a single striation.

Where fragments of this species occur, from the large branches, and the widening below the bifurcations, which, when the branches are broken off a short distance above, present a clavate appearance, they very much resemble a Thamniscus, this is especially the case where the depressed dissepiments of the poriferous side are covered with sediment, while the branches are not; without a critical examination it would be considered a Thamniscus.

This species can be distinguished from *F. multiplex* by its more robust form, and the greater number of ranges of cell apertures.

Formation and locality. Hamilton group; Ontario, Canada.

FENESTELLA FISTULATA, *n. sp.*

Bryozoan, broadly infundibuliform or cup shaped.

Branches slender, gradually increasing in size to the bifurcations; bifurcations distant from five to ten millimetres; diameter of branch just below bifurcation a little less than .5 mm., above bifurcation, .33 mm.; the distance between branches is less than the width, or about .25 mm.; from nine to eleven branches in the space of five millimetres; on non-poriferous side branches slightly angular, and having along the middle a narrow, slightly elevated carina or keel, which connects with similar carinæ on the dissepiments; when the dissepiments or opposite ends of the branch alternate, the carina of the branch, in order to connect with the carina of the dissepiments, assumes a zigzag form, and also surrounds the fenestrules with a hexagonal elevation. There is no evidence of striae or of nodes.

Dissepiments comparatively strong, .25 mm. in width, expanding at the junction with the branches, depressed on both poriferous and non-poriferous side; on non-poriferous side, carinated and slightly angular; on poriferous side rounding.

Fenestrules small, oval; length from .33 to .50 mm., width about two-thirds the length, appearing the same size on each face of the frond.

Cells in two and three ranges, sometimes the third range extends only a short distance below the bifurcation, at others nearly the whole length to the next bifurcation; apertures, minute, circular, about .12 mm. in diameter, distant from each other less than the diameter of an aperture, twenty-five in the space of five millimetres, opening nearly directly upward; margins distinctly elevated, but on account of the apertures opening upward, scarcely indenting the border of the fenestrule ranges of apertures separated by a narrow, slightly elevated, flexuous ridge, which is shorter and more prominent when there are only two ranges of pores present.

This species is one of the most abundant of those occurring in the Hamilton group, and its poriferous face is generally easily recognized; from *F. multiplex* and *F. latitruncata* it is easily distinguished by its size and compactness.

Formation and localities: Hamilton group; Genesee and Erie counties, N. Y., and West Williams, Ontario.

FENESTELLA ASPECTUS, *n. sp.*

Bryozoan infundibuliform, undulating, frequently partially folded upon itself on a line with the branches.

Branches slender, gradually increasing in size to the bifurcations, which are distant from each other from three to fifteen millimetres; a transverse section of the branch is sub-cuneiform in outline, the widest part is on the poriferous side; just below the bifurcation on the poriferous side the branch is about .5 mm. in width, gradually growing smaller to the non-poriferous face, where it is less than half that width; just above bifurcation on poriferous side the branch is .33 mm.

in width; ten branches in the space of five millimetres; on non-poriferous side the branches are rounded or circular, and frequently have a very narrow, slightly elevated keel or striation running along the middle, which connects with a similar keel on the dissepiments, and opposite each dissepiment is a prominent triangular node.

Dissepiments slender, about .25 mm. in diameter, eight or nine in the space of five millimetres, much expanded at their junction with the branches; on non-poriferous side depressed, and with a thin, slightly elevated carina; on the poriferous side they are scarcely perceptible.

On account of the cuneiform shape of the branches, the fenestrules on the different faces of the frond have an entirely different appearance; on the non-poriferous side the fenestrules appear broadly oval, or nearly circular, a little less than .5 mm. in length and of about the same width; the branches rapidly thicken to the poriferous side where they are contiguous or nearly so, the fenestrule generally not showing at all, and when showing appearing only as a narrow slit.

Cells in two or three ranges, two ranges occur for only a short distance above the bifurcation, the greater part of the branch being occupied by three ranges; apertures small, circular, about .16 mm. in diameter, closely arranged, frequently nearly contiguous, twenty-eight in the space of five millimetres, the central row opening directly upward, the two outer rows nearly upward, slightly lateral; margins distinctly elevated and unusually thick; the margins of the outer rows of adjacent branches are separated only by a narrow line, sometimes contiguous; the central row of apertures is elevated above the outer rows, making the branch angular.

This species is not common, and when the poriferous face is seen is easily recognized; like *F. fistulata*, the cells are arranged in two and three rows and the branches are nearly of the same size, but it differs in having the cell apertures larger and much more closely arranged, and the central row much elevated, making the branch angular, while in that species the branch is nearly if not quite flat, the apertures being on the same plane; the contiguity of the branches, or the poriferous face, is also a distinguishing characteristic.

Formation and locality. Hamilton group; Bellona, New York.

FENESTELLA ANGUSTATA, *n. sp.*

Bryozoan infundibuliform; fronds large.

Branches of nearly the same size throughout their entire length, except immediately below the bifurcations, or increasing in size very gradually; bifurcations at very irregular distances from each other, varying from five to fifteen millimetres; width of branches from .33 to .50 mm.; distance apart less than the width of the branches; from ten to thirteen branches in the space of five millimetres; on non-poriferous side the branches are rounded, with generally a single range of nodes along the middle; sometimes there are additional scattering nodes with indistinct evidences of striations; on other parts of the frond the nodes are obsolete, either from wearing or some other cause not apparent, and there are from three to five strong striations on a branch.

Dissepiments comparatively strong, about .25 mm. in diameter, expanding at their junction with the branches, nine or ten in the space of five millimetres; on non-poriferous side rounded, nearly on a plane with the branches, granulose; on poriferous side depressed slightly below the ranges of apertures.

Fenestrules on non-poriferous side broadly oval, appearing narrower on poriferous side; length about .5 mm.; width from one-half to two-thirds the length.

Cells in two ranges, opening at an angle of forty-five degrees from the axis of the branch; apertures small, circular, about .14 mm. in diameter; distance apart less than the diameter of an aperture, twenty-eight to thirty in the space of five millimetres; apertures distinctly elevated and indenting the border of the fenestrules; space between the ranges of apertures carinated; carina sharp, slightly elevated, and having prominent nodes or short spines, four in the space of one millimetre.

To the poriferous side of *F. fistulata* this species has no resemblance; it slightly resembles the non-poriferous side, from which, however, it is readily distinguished by the absence of the keel along the middle of the branch and on the dissepiments, and by the presence of striations, nodes and granules.

Formation and locality. Hamilton group; Alden, Erie Co., N. Y.

FENESTELLA MARCIDA, *n. sp.*

Bryozoan, consisting of large infundibuliform fronds, frequently undulating or partially folding upon itself along the line of the branches. Branches slender, very gradually enlarging to the bifurcations, which are distant from each other from seven to twenty-four millimetres; width below bifurcation .33 mm.; width just above bifurcation .25 mm.; distance from each other equal to or a little more than the width of the branches, sometimes appearing less on poriferous side than on non-poriferous; on non-poriferous side branches rounded, except just below bifurcation, where they are flattened, striated; striæ fine but distinct, finely granulose, from three to five on a branch.

Dissepiments about .20 mm. wide, eight in the space of five millimetres; on some fronds the width is .25 mm., nearly equal in width to some parts of the branches, expanding slightly at their junction with the branches; on non-poriferous side depressed, striated; striæ granulose; on poriferous side slightly depressed, rounding, carinated; carina very thin, slightly elevated.

Fenestrules broadly oval, occasionally subquadrangular; length nearly .5 mm.; width two-thirds the length; on poriferous side the fenestrules appear narrower, the width often not more than one-third the length and sometimes appearing only as a narrow slit.

Cells in two ranges, apertures small, circular; diameter about one-seventh of one millimetre; distant from each other less than the diameter of an aperture, seven to eight in the space of five millimetres; margins distinctly elevated and indenting the border of the fenestrule; space between ranges of apertures carinated; carina spinulose; nodes or spines prominent, about .16 mm. in height, three in the space of one millimetre.

This is a very abundant species; it is very similar to *F. angustata*, but is of less compact growth; the non-poriferous side is very finely granulose, while that species has a line of comparatively strong nodes along the middle of the branch.

Formation and localities. Hamilton group; Darien and Moscow, N. Y.

FENESTELLA PLANIRAMOSA, *n. sp.*

Bryozoan fan-shaped, no perfect frond observed; largest fragment seen five centimetres long and four wide.

Branches slender, bifurcations at very irregular distances from each other, varying from four to twenty-five millimetres; the branches just below bifurcation are of the same width, so that where the bifurcations are close together the branches increase rapidly in width, where they are distant they increase very gradually; branches just above bifurcation .33 mm. in width; just below, .66 mm. in width. The space between the branches is greater than their width; from four to seven branches in the space of five millimetres; on non-poriferous side, just above the bifurcation, the branch is rounded, sometimes slightly angular, soon becoming flattened, and for the greater part of the length flat or slightly concave; striated; striæ very fine but distinct, from four to nine on a branch.

Dissepiments extremely slender, about .20 mm. in width; distance from each other variable, from two to four millimetres, generally a little over three millimetres, not expanding at their junction with the branches, frequently curving; on non-poriferous side often arching, striated, rounding.

Fenestrules quadrangular; length variable but usually slightly less than three millimetres; width varying from .50 to .66 mm.

Cell apertures in two and three ranges, two for the greater part of the length of the branch; apertures small, oval or circular, opening obliquely; about .20 mm. in length; distance apart varying from about two-thirds to a little more than the diameter of an aperture, from twelve to eighteen in the space of five millimetres; margin of the lower portion of aperture elevated more than that of the upper portion; space between the ranges of pores occupied by a carina; carina sharp, elevated one-fifth of one millimetre, and having prominent nodes or spines which are elevated above the carina equal to the height of the carina; three in the space of two millimetres.

Formation and locality. Hamilton group; Bellona, Yates Co., N. Y.

FENESTELLA CINCTUTA, *n. sp.*

Bryozoan occurring only in fragments; the form of a perfect frond is not known; one fragment, the largest seen, is somewhat curved as if forming part of a frond infundibuliform in shape, but one of the edges of the fragment is entire, rounded, and non-celluliferous, which shows that the frond could not have been continuous; the largest fragment observed is three and one-half centimetres long and two and one-half wide.

Branches comparatively strong, increasing in size but slightly, if any, below bifurcations; width of branch .66 mm.; branches flexuous, regularly bent from side to side, forming on each side of the branch convexities and concavities, which alternate with each other, the convexities of contiguous branches uniting and coalescing; on non-poriferous side the branches are slightly angular, with a carina running along the middle; the carinæ of two contiguous branches, at the anastomosed part, sometimes unite and form on that portion one carina, at other times there is a space of .25 mm. or more, which is deeply channeled.

Dissepiments or anastomosed portions of the branch vary in width from .66 mm. to 1.33 mm.; the narrower ones are in reality not anastomosing, but very short celluliferous dissepiments; there are three in the space of five millimetres.

Fenestrules oval, one millimetre in length, .66 mm. in width.

Cells in three ranges; on the dissepiments sometimes one or two ranges more; apertures minute, circular, a little more than .20 mm. in diameter, closely arranged, frequently nearly contiguous, eighteen in the space of five millimetres; the central range opens directly upward, the outer range nearly directly upward, very slightly laterally; margins comparatively strong, very distinctly elevated.

Formation and locality. Hamilton group; Ontario, Canada.

FENESTELLA PERUNDULATA, *n. sp.*

Bryozoan probably infundibuliform in shape.

Branches moderately strong, .5 mm. in width; space between the branches more than the width of the branches, seven branches in the space of five millimetres; on non-poriferous side angular, carinated; carina and upper part of the branch regularly flexuous; at the dissepiments the carina and angular portion of the branches frequently meet and coalesce, giving the appearance of anastomosing branches.

Dissepiments strong, from .50 to .66 mm. in width, expanding at their junction with the branches, about three in the space of five millimetres; on non-poriferous side, angular and on a plane with the branches; on poriferous side depressed, rounding.

Fenestrules small, oval, .75 mm. in length, .5 mm. in width.

Cells in two ranges; apertures small, circular, opening nearly directly upward, about .16 mm. in diameter, distance apart less than the diameter of an aperture, about twenty in the space of five millimetres; margins distinctly elevated; space between ranges of apertures carinated; carina strong, with an elevation equal to the thickness of a branch, and slightly expanded and flattened at the top; width of expanded portion .25 mm.; finely striated.

On the poriferous face the branches, carinations and ranges of apertures are straight, presenting a somewhat rigid appearance, while on the non-poriferous face the whole upper portion of the branch is regularly flexuous. Sometimes, on the dissepiments, the carinations meet, coalesce, and form a carination across the dissepiments; at others there is a space between of .25 mm.; sometimes this space is smooth and deeply channeled across the dissepiment, at others the dissepiment has a carina connecting the carinæ of the adjacent branches; the two faces present such a different appearance, that were it not for the fact that both sides of the same specimens are seen they would be very easily mistaken for different species.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA ASSITA, *n. sp.*

Bryozoan probably infundibuliform, though occurring only in fragments in the present collections; largest fragment observed two and one-half centimetres long, two centimetres wide.

Branches moderately strong, gradually enlarging in size to the bifurcations, which are distant from each other from three to fourteen millimetres; width of branches on non-poriferous side .33 mm., on poriferous side about .50 mm.; space between branches less than the width of the branches, ten branches in the space of five millimetres; on non-poriferous side branches rounding, carinated; carina thin, elevated about .20 mm., and obscurely nodose.

Dissepiments strong, .33 mm. in width, eight in the space of five millimetres, expanding at their junction with the branches; on non-poriferous side, on a plane with the branches, carinated; on poriferous side depressed, carinated.

Fenestrules oval, about .33 mm. in length; width on non-poriferous side about two-thirds the length; on poriferous side they are very obscure, either not perceptible or appearing as very narrow slits.

Cell apertures in two and three ranges; the greater part of the length of the branch has only two ranges; in a branch which is eleven millimetres long before bifurcating, eight millimetres of that length has two ranges of cells, and three millimetres three ranges; apertures small, circular, opening directly upward, about .16 mm. in diameter; distance between apertures less than the diameter of an aperture, twenty apertures in the space of five millimetres; margins distinctly elevated; space between ranges of apertures carinated; carina strong, not much elevated, and having minute spines situated at quite regular distances from each other, about twenty in the space of five millimetres; the ranges of apertures on adjacent branches are nearly contiguous.

Formation and locality. Hamilton group; New York.

FENESTELLA INFLEXA, *n. sp.*

Bryozoan infundibuliform; fronds large, largest fragments seen seven millimetres across.

Branches flexuous, forming on each side of a branch regular and alternate convexities and concavities; the convexities of the opposite side of adjacent branches frequently contiguous; coalescing; bifurcations distant from each other from two to ten centimetres or even more; width of branch .5 mm., eight in the space of five millimetres; on non-poriferous side the branches are angular and carinated; where two branches or the carinations of two branches unite there is very frequently a small spine or node.

Dissepiments or points of anastomosing about .66 mm. wide, four in the space of five millimetres; sometimes the branches simply anastomose; at other times there is a short dissepiment.

Fenestrules small, oval, .66 mm. in length; width about one-half the length. On the poriferous side the branches are angular.

Cells in two ranges, opening nearly directly upward, apertures minute, circular, about .20 mm. in diameter, closely arranged; distance between apertures less than the diameter of an aperture; sometimes nearly contiguous, eighteen in the space of five millimetres; margins distinctly elevated; space between ranges of apertures angular, carinated; carina sharp, sinuous, elevated about .20 mm.

The non-poriferous face presents a variety of phases; sometimes the carinæ of adjacent branches unite and immediately separate, leaving the point of union merely a point which generally has a node or spine, and presents the appearance of a diamond-shaped elevation inclosing the fenestrule, sometimes they remain united for the space of half a millimetre or more, at other times they do not meet and the space between is sometimes channeled, and at others there is a transverse carination, connecting the two longitudinal carinations. This latter form occurs where the branches are united by dissepiments instead of anastomosing, and presents the appearance of an hexagonal elevation inclosing the fenestrule.

This species is very similar to *F. perundulata* on the non-poriferous face and without very critical comparison it would be difficult to distinguish them; but on the poriferous face the difference is more evident. In this species the carina separating the row of apertures is thin, sharp, highly elevated and very sinuous. In *F. perunduldta.* it is strong, elevated equal to the thickness of the branch expanded at the top, and straight.

Formation and locality. Hamilton group; West Bloomfield, New York.

FENESTELLA PERFORATA, *n. sp.*

Bryozoan consisting of large infundibuliform fronds; fragments are of six centimetres in length and five in breadth, evidently only a small portion of the frond; thickness of frond one and one-half millimetres; frond consisting of numerous cylindrical branches which frequently and irregularly bifurcate, and are connected by dissepiments; along the middle of the branches and dissepiments on the celluliferous face there is a keel or carina, which is elevated and expands above, forming secondary branches and dissepiments very similar in appearance to the principal ones.

Branches moderately strong, about .5 mm. in width, eight branches in the space of five millimetres; branches regularly sinuous, forming on each side of the branch regularly alternating curvatures and concavities; the convexities of adjacent branches approach each other, but very seldom unite, being connected by dissepiments; on non-poriferous side the branches are rounding or slightly angular and have along the middle a carina; carina thin, slightly elevated and connected with similar carinæ on the dissepiments.

Dissepiments strong, of about the same width as the branches, five in the space of five millimetres; on non-poriferous side on the same plane as the branches; rounded or slightly angular; carinated; carina thin, slightly elevated and connected with the carinæ of the branches.

Fenestrules small, oval, slightly more than .5 mm. in length; width two-thirds to three-fourths the length.

Cells in two ranges, opening directly upward; apertures minute, nearly circular, about one-sixth or one-seventh of one millimetre in diameter, closely arranged, distance apart less than the diameter of an aperture, occupying the dissepiments as well as the branches, and forming an oval arrangement; the margins are distinctly elevated and indent the borders of the fenestrules; the space between the apertures both on the branches and dissepiments is carinated; carina thin and elevated about the thickness of the branch, when it expands and forms secondary non-celluliferous branches and dissepiments; branches .33 mm. in width, round, and having a carina; carina thin, but slightly elevated, though very distinct; branches regularly sinuous; dissepiments of the same width as the branches, round, carinated; carina similar to and connected with those of the branches.

Fenestrules oval or circular; the circular form has a diameter of about .66 mm.; the oval forms are .66 mm. (sometimes a little more) in length and about .5 mm. in width.

The two faces of the frond are very similar in appearance, the principal branches being a little wider than the secondary ones; the sinuosity of the branches and the connecting carinæ of the branches and dissepiments present the appearance of fenestrules enclosed by a hexagonal angular elevation; the dissepiments being of the same width as the branches on the same plane and similarly carinated, and the branches being quite irregular, it is sometimes very difficult to distinguish them.

Formation and locality. Hamilton group; New York.

FENESTELLA SCALARIS, *n. sp.*

Bryozoan consisting of large infundibuliform fronds; largest fragment seen seven centimetres long and nearly four centimetres wide.

Branches slender, very gradually increasing in size to the bifurcations, which are distant from each other from five to thirty millimetres, generally from fifteen to twenty millimetres; width of branches about .33 mm.; distance between branches less than the width of the branches, from nine to eleven branches in the space of five millimetres; on non-poriferous side branches rounded, carinated; carina slightly elevated and finely nodose, about seven nodes in the space of one millimetre; on some fronds the nodes are more distant, and the rest of the branch is granulose.

Dissepiments comparatively slender, less than .25 mm. in width, six in the space of five millimetres; on non-poriferous side, on a plane with the branches, rounded, carinated; carina similar to the carina of the branch.

Fenestrules oval, length about .66 mm., width from one-half to two-thirds the length.

Cells in two ranges, opening nearly directly upward; apertures minute, circular, about .20 mm. in diameter, distance apart equal to and slightly more than the diameter of an aperture, about twenty in the space of five millimetres; margins slightly elevated, and indenting the border of the fenestrule; space between the ranges of apertures elevated, carinated; carina thin, elevated, nearly equal to the thickness of the branch, the upper half slightly expanded, and having a sharp, thin crest, the carinæ connected by their lateral projections or bars, which are very thin and extend down the side of the carinæ obliquely about .20 mm., or a little more, about eighteen bars in the space of five millimetres.

Where the poriferous face is seen this species can be easily distinguished by the very thin lateral bars connecting the carinæ, and their comparatively great distance apart. The species of the genus Fenestella are so similar in appearance, that without both poriferous and non-poriferous faces, it is sometimes very difficult to assign a specimen to the right species.

Formation and localities. Hamilton group; Bellona, N. Y., and West Williams, Ontario.

FENESTELLA EXORNATA, *n. sp.*

Bryozoan probably infundibuliform, though occurring only in fragments in the present collections; largest fragment seen five centimetres long and three wide.

Branches moderately slender, appearing more slender on non-poriferous side than on poriferous, gradually increasing in size to the bifurcations, which are distant from each other generally from five to seven millimetres; branches from .33 to .50 mm. in width; space between the branches on non-poriferous side more than the width of branches, on poriferous side about equal to the width, five or six branches in the space of five millimetres; on non-poriferous side flat, with a comparatively thin, sharp elevation around the edge of the fenestrules; the space between these elevations flat or slightly concave, with frequent, short, broad, conical spines, about .20 mm. in height.

Dissepiments strong, frequently as wide as, or wider than the branches, there are four in the space of five millimetres, greatly expanding at their junction with the branches, on a plane, and having the same appearance in every respect as the branches on their non-poriferous side; on poriferous side very much depressed and flattened.

Fenestrules, on non-poriferous side, appearing broadly oval, on poriferous side elongate-oval; length from three-fourths to one millimetre; width on poriferous side .5 mm.

Cells in two ranges, opening slightly laterally; apertures small, circular; diameter about .16 mm.; distance apart equal to or a little more than the diameter of an aperture, about twenty in the space of five millimetres; margins slightly elevated; space between the rows of apertures carinated; carina thin, sharp, consisting of two plates, which coalesce near the crest; height of carina .75 mm., or nearly twice the width of the branches.

This species is very characteristic and is easily recognized from either surface, from non-poriferous by the flat branches, with elevation around the fenestrule; and from the poriferous face by the thin greatly elevated carina, in which respects it differs from any other known species of this formation.

Formation and locality. Hamilton group; Alden, Erie county, N. Y

FENESTELLA QUADRANGULA, *n. sp.*

Bryozoan probably infundibuliform in shape though, so far as observed, occurring only in small fragments; frond rigid in appearance.

Branches slender, very gradually increasing in size to the bifurcations which are distant from each other from five to fifteen millimetres, generally from ten to twelve millimetres; width of branches from .33 to nearly .50 mm. space between the branches more than the width of the branches; nine branches in the space of five millimetres; on non-poriferous side, branches rounded and frequently having a node or spine opposite the dissepiments; striated; striæ fine; sometimes entirely concealed by fine granules.

Dissepiments slender, less than .25 mm. in width; seven in the space of five millimetres, expanding at their junction with the branches; on non-poriferous side on a plane with the branches, rounding; poriferous side depressed, angular; slightly carinated.

Fenestrules broadly oval or sub-quadrangular; length from .50 to .66 mm.; width from .33 to .50 mm. Cells are in two ranges, opening slightly laterally; apertures minute, .16 mm. in diameter, very closely arranged; distance apart about one-half the diameter of an aperture; twenty-two in the space of five millimetres; margins slightly elevated; space between ranges of apertures, angular, carinated; carina moderately strong; very slightly elevated and having a row of nodes; nodes moderately strong, about four in the space of one millimetre.

Formation and locality. Hamilton group; Darien, N. Y.

FENESTELLA EMACIATA, *n. sp.*

Bryozoan occurring only in fragments, the form of the whole frond is not certainly known, but probably infundibuliform; largest fragment observed five centimetres long and three wide.

Branches moderately slender; not increasing in size, except just below the bifurcations, which are distant from each other from four to twenty-four millimetres — generally about fifteen millimetres; width of branches from .33 to .50 mm.; space between about equal to the width of the branches; seven branches in the space of five millimetres; on non-poriferous side, rounded, striated; striæ moderately strong, from three to five on a branch; finely granulose; sometimes the central stria resembles a narrow carina.

Dissepiments about .25 mm. in width; six in the space of five millimetres; slightly expanding at their junction with and oblique to the branches; angle of obliquity from ten to twenty degrees; on non-poriferous side moderately depressed, rounded, transversely striated; granulose; on poriferous side, very much depressed, slightly angular, carinated; carina slight.

Fenestrules oval or subquadrangular; length .66 mm.; width from .33 to .50 mm.

Cells in two ranges opening laterally; apertures small, .20 or .16 mm. in diameter, closely arranged, frequently nearly contiguous; from twenty to twenty-five in the space of five millimetres; margins elevated and indenting the border of the fenestrule.

Space between the ranges of apertures elevated, height equal to one-half the thickness of the top of the branch; slightly rounding; not acutely angular, having a row of nodes; nodes minute; frequently wanting.

This species differs from *F. marcida* by having stronger, more widely separated branches; dissepiments farther apart and oblique to the branches; on the poriferous side the cells open more laterally; the space between the cells is elevated, not carinated, and comparatively thick, and without the closely arranged, prominent nodes of that species.

Formation and locality. Hamilton group, shore of Seneca lake, N.Y.

FENESTELLA CURVATA, *n. sp.*

Bryozoan infundibuliform; largest fragments seen four millimetres in length and of about the same width.

Branches slender, scarcely increasing in size to the bifurcations, which are distant from each other from four to fifteen millimetres, generally about ten millimetres; width of branches from a little less than .25 to .33 mm., occasionally slightly more; transverse section subcuneiform in outline; space between branches greater than the width of the branches; seven branches in the space of five millimetres; when the dissepiments on opposite sides of the branches alternate, the branch is flexuous, but not when the dissepiments are opposite each other; on non-poriferous side the branches are rounder, in well-preserved specimens showing fine, granulose striæ, from five to seven on a branch; generally opposite the dissepiments there is a prominent, conical spine about .25 mm. in height.

Dissepiments comparatively strong; width nearly or quite equal to that of the branches; thirteen in the space of ten millimetres; not expanding at their junction with the branches; on non-poriferous side slightly depressed, rounding; on poriferous side scarcely perceptible.

Owing to the sub-cuneiform shape of the branches the fenestrules of the poriferous and non-poriferous face present an entirely different appearance; on non-poriferous face they are broadly oval or sub-quadrangular; .66 mm. in length; width from .50 to .66 mm.; on the poriferous side they frequently appear merely as narrow slits; sometimes the branches are apparently contiguous.

Cells in two ranges, opening slightly laterally; apertures minute, circular, diameter about .20 mm., closely arranged; distance apart from one-half to one diameter of an aperture, about twenty in the space of five millimetres; margin distinctly elevated and indenting the border of the fenestrule; space between ranges of apertures carinated; carina thin, slightly elevated and having prominent nodes or short spines, two in the space of one millimetre.

When both the poriferous and non-poriferous faces of this species can be seen, it will be very easily distinguished from any other species of this formation.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA BREVILINEA, *n. sp*

Bryozoan probably infundibuliform, largest fragment seen seven centimetres wide and five long.

Branches moderately strong, a transverse section sub-cuneiform in outline — the widest portion on poriferous side — gradually increasing in size to the bifurcations, which are distant from each other from seven to twenty millimetres; width of branches from .33 to .66 mm.; space between branches greater than the width of the branches, five or six in the space of five millimetres; or when the dissepiments on opposite sides of the branches alternate, which is generally the case, the branches are sinuous; on non-poriferous side rounding or slighty angular, carinated; carina thin, but slightly elevated, sinuous; surface pustulose.

Dissepiments from .50 to .66 mm. in width, three in the space of five millimetres on non-poriferous side, on a plane with the branches, rounded, with a semi-circular carination; pustulose.

Fenestrules oval; owing to the sub-cuneiform shape of the branches, the fenestrules on poriferous and non-poriferous sides present a widely different appearance; on non-poriferous side 1.33 mm. in length, .50 mm. or slightly more in width; on poriferous side they appear much smaller, both in regard to length and width.

Cells in two ranges minute, circular or lunate, opening slightly laterally; diameter .20 or .16 mm.; space between the apertures longitudinally, equal to or more than the diameter of an aperture; ranges of apertures separated by a carina, which is very much elevated; height about .75 mm., or more than the thickness of the branch; at the base it is nearly .25 mm. in thickness, continuing of that thickness for about one-third the height of the carina, where it abruptly narrows and for the rest of the height the carina is extremely thin. Owing to the sudden contraction of the carina it appears to have a ridge upon the side when viewed from above; apparently the dissepiments sometimes have a similar ridge; though not invariably, as the specimens, so far as observed, never occur with the poriferous face free, and the carina being extremely thin, so that in separating from the rock it might possibly be that the carinæ of the dissepiments, if any exist, are broken. The non-poriferous face, on different portions of the frond, presents a variety of appearances; on some portions apparently the branches have a continuous carina very thin and but slightly elevated and the dissepiments with a semi-circular carina, not connecting with the carina of the branch; on other portions the fenestrules are surrounded by thin elevations, the space between being somewhat flattened and in the wider portions having slightly elevated irregular lines and in the narrower portions pustulose.

This species can be distinguished from *F. exornata* by its coarser appearance as well as by the different ornamentation of the non-poriferous face of the branches.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA SUBTORTILIS, *n. sp.*

Probably infundibuliform in shape, but occurring only in fragments; largest fragment observed three centimetres long and two and one-half in diameter.

Branches comparatively slender, of nearly the same width throughout their entire length; bifurcations distant; width of branches from .25 to a little more than .33 mm.; space between equal to or a little more than the width of the branches; nine branches in the space of five millimetres; where the dissepiments on opposite sides of the branches alternate, which is generally the case, the branch is regularly flexuous; on non-poriferous side the branches are moderately convex, and with a thin, slightly elevated carina running along the middle which is frequently obliterated by weathering; the carina is finely nodose, the rest of the branch is also nodose or granulose; branches wider on poriferous side, giving the appearance of being more densely arranged than on the non-poriferous side.

Dissepiments strong, as wide or wider than the branches, six in the space of five millimetres; on non-poriferous side, on a plane with or elevated slightly above the branches, rounded, carinated; carina thin, slightly elevated and connecting with the carinæ of the branches; on poriferous side depressed, narrower than on the non-poriferous side.

Owing to the branches being widest on the poriferous side, the appearance of the fenestrules on the poriferous face varies from that of the non-poriferous side; on which side they are broadly oval or circular; length about .5 mm.; width from three-fourths to equal the length; on poriferous side they appear much narrower, the branches sometimes being nearly contiguous.

Cells in two ranges, opening directly upward; apertures minute, circular, about .20 or .16 mm. in diameter; distance apart equal to or less than the diameter of an aperture, eighteen in the space of five millimetres; margins thin, elevated; space between ranges of apertures carinated; carina at first very thin, sinuous, thickening immediately to about .25 mm., and having on top a thin, very slightly elevated crest. This species, especially on poriferous side, has some resemblance to *F. perundulata*, but is a much finer frond; the non-poriferous face resembles *F. curvata*, but the branches are stronger, more compactly arranged, and without spines or prominent nodes; the poriferous side is very dissimilar.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

FENESTELLA STRATA, *n. sp.*

Bryozoan infundibuliform; largest fragment observed five centimetres long and three wide.

Branches moderately strong; widest on the poriferous side, where they are .5 mm. in width; on non-poriferous side about .25 mm.; extremely sinuous, forming at the sides of the branch alternating and regular convexities and concavities; the convexities of adjacent branches touching and coalescing; on poriferous side the branches are angular, having a slight keel, which is conspicuously nodose, owing to that side of the branch being the narrowest and the angular tops of the branches coalescing; the sinuosity of the branches is much greater on the non-poriferous side, forming diamond-shaped elevations; the frond presenting a reticulated appearance, and it is with great difficulty that the direction of the branches can be determined.

Dissepiments; the points of coalition or anastomosing are in width equal to or a little more than that of the branches; four in the space of five millimetres.

Fenestrules on non-poriferous side oval, sometimes nearly circular, usually about one millimetre in length; width two-thirds to three-fourths the length; the size and shape, however, are somewhat variable; on non-poriferous side appearing much smaller both as regards length and breadth; the branches on poriferous side, though sinuous, present a much straighter appearance than on the non-poriferous side.

Cells in two ranges, opening directly upward or slighly laterally, minute, circular; .14 mm., or a little less, in diameter; distance apart more than the diameter of an aperture, about eighteen in the space of five millimetres; margins thin, distinctly elevated; space between the ranges of apertures carinated; carina moderately thin, elevated about .20 mm., sinuous and finely crenulate.

This species in its sinuous, anastomosing branches resembles *F. inflexa*, but the branches are more slender, and on the non-poriferous side it has two ranges of apertures, divided by a carina, while that species has three or more ranges without carina. In *F. perundulata* the frond on non-poriferous face has a much more irregular appearance, and is more decidedly anastomosing.

Formation and locality. Hamilton group; Moscow, Livingston county, N. Y.

ON THE STRUCTURE OF THE SHELL IN THE GENUS ORTHIS.

By James Hall.

It is generally pretty well known among palæontologists, at the present time, that the genus Orthis, as constituted by Dalman, contains heterogeneous material; and that the species do not form the well characterized natural group sometimes claimed for them.

Leaving out of consideration the two species first named by the author of the genus, which are marked with an ?, the remaining species exhibit a considerable variety of external form and of internal marking, which characters alone are sufficient to distinguish them generally from one another.

The general aspect of the shells constituting the genus, as described by its author and extended by subsequent writers, is a sub-circular or sub-quadrate form; valves sometimes nearly equally convex, while in other examples one valve may be flat or concave. This latter feature may affect either the ventral or the dorsal valve. Both valves are furnished with an area, though this character is often but slightly developed in the dorsal valve; the opposite valve is furnished with wider area and open triangular fissure for the passage of a pedicil. The hinge line is straight, usually shorter than the width of the shell. The surface is striated or plicated, and the general aspect of nearly all the forms is so similar that they have been grouped together, generally, and by the best authors, without hesitation.

The most conspicuous external difference is between a finely striated, and a coarsely plicate surface. These differences are often accompanied by another distinguishing feature. The coarsely plicate forms, among the American species, are usually what are termed *resupinate shells;* the dorsal valve being the more convex and the ventral valve flat or concave and sometimes sinuate in front, but still carrying its conspicuous area and foramen. On further examination we find that many striated species are resupinate, or have the dorsal valve the more convex. An examination of the interior of the shell in all these forms shows that the muscular impression in the ventral valve is strongly defined, distinctly bilobate, limited at the margins by a strong ridge or elevated lamella, usually interrupted or non-continuous in the front. (These forms are chiefly of lower or middle Silurian in their geological range.)

On comparing other forms of the genus where the valves are nearly equal, or where the shell is plano-convex, the more convex valve is the ventral. There are also resupinate forms which are closely allied to them; but, as a rule, the forms with finely striated surface, subequivalve or plano-convex, have the ventral valve the more convex; and the muscular impression is flabelliform with its margins lobed, and more or less distinctly limited by an elevation of the interior substance of the shell.

The resupinate forms which are more closely allied to those with flabelliform ventral muscular impressions, have the corresponding muscular imprint more strongly defined and less distinctly lobed at the margins than in the forms just noticed.

These are the most obvious distinctions among the prevailing forms of the genus ORTHIS as constituted by Dalman.

The *Orthis* (*Platystrophia biforata*) is, in some degree, an exception to all the forms above mentioned, having both valves very convex, the surface strongly plicated, with a mesial fold and sinus, as in SPIRIFERA. In its muscular areas it resembles the resupinate forms of ORTHIS of the lower Silurian rocks, often presenting an abnormal thickening of the shell around the muscular area of the ventral valve.

The *Orthis biloba* (*Dicœlosia biloba* of King) of the upper Silurian rock also presents a departure from the typical forms of Orthis, but preserves the similar muscular system.

Before undertaking a revision of the materials constituting the genus ORTHIS, it has seemed desirable to ascertain whether the variations in form, surface ornamentation, or character of muscular impression, is associated with any difference in the shell-structure. For this purpose, cuttings, prepared for microscopic examination, have been made from many species, and the result has proved that all the resupinate lower and middle Silurian forms, whether plicate or finely striate, are fibrous shells, with the ventral muscular impression small and strongly limited. They are essentially either free from punctæ in any form, or with a few scattered pustuliform pores. The finely striate sub-equivalve or plano-convex forms with flabelliform muscular impressions, have the shell punctate in lines, or radiating belts, corresponding to the rays of the shell, with an intermediate fibrous texture. The character of the punctæ, the strength and comparative width of the punctate bands, vary with the different species.

In the finely striated, resupinate forms of the Lower Helderberg, Hamilton and Chemung groups, with the smaller and more distinctly limited flabelliform ventral muscular areas, the punctate character is very marked, often occupying almost the entire surface, and the lines of the radii are shown only by a more crowded condition of the punctæ. The resupinate species here referred to are quite different in their outline and general form from those of the lower rocks, being for the most part rotund forms with the cardinal extremities rounded. These species are easily recognized, and readily distinguished from those of the preceding group by their external form alone.

The numerous species which have been already studied in their microscopic shell-structure are naturally separated into three distinct groups which may be of generic value.

The first group includes the coarsely plicate forms, with extended cardinal angles; the valves resupinate or normal in their relations; the test is coarsely fibrous, and usually without punctæ, although some species occasionally show a few large scattered pores or ducts near the front of the shell.

Professor King has proposed the name PLATYSTROPHIA for *Orthis biforata*, and this species in its fibrous and non-punctate texture, may be taken as characteristic of the first group, although there are some features, especially in the form of the shell and also in the muscular impressions, which do not in every respect agree with other members.

With our present knowledge, we may include in this group the following species:

Platystrophia biforata, Trenton and Hudson River groups.
" tricenaria, " " " "
" subquadrata, Hudson River group.
" borealis, " "
" occidentalis, " "
" plicatella, " "
" flabella,* Niagara group.

This list will be greatly extended as soon as the shell-structure of allied species can be studied. At present only those species are included which have been studied under the microscope.

The second group embraces forms which are usually regarded as typical species of the genus ORTHIS. The shell-structure characterizing this group may be described as finely fibrous, with distinct rows of punctæ coming out along the summit of the radii; the rows of punctæ are simple, or double in some species (O. Clytie), but usually there are several rows to each ray.

The following species of this group have been microscopically studied in numerous specimens:

Orthis testudinaria, Trenton and Hudson River groups.
" perveta, " " " "
" Clytie, Hudson River group.
" elegantula, Niagara group.
" hybrida, " "
" Vanuxemi, Hamilton group.
" Penelope, " "

The third group, consisting of *O. multistriata* of the Lower Helderberg group, *O. Iowensis* of the Hamilton group, *O. Tulliensis* of the Tully Limestone, and *O. impressa* of the Chemung group, is highly punctate, with a fine fibrous texture of the shell-substance. In the great number of the punctæ and for the most part their uniform character, together with their arrangement, these forms of the *Orthidæ* resemble species of *Terebratula*, *Cyrtina*, etc. The name *Schizophoria*, King, may be adopted for this latter group of species.

The accompanying illustrations (plates 3 and 4) will serve to give a clear idea of the microscopic characters presented in the shell-structure of specimens in each of the three groups indicated.

The preparation of the shell sections and the photographs of these for the lithographer have been made by Mr. C. E. Beecher of the State Museum.

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*Not Orthis flabella of Sowerly.

DESCRIPTION OF A NEW SPECIES OF STYLONURUS FROM THE CATSKILL GROUP.

BY JAMES HALL.

Sometime during the year 1882 Prof. Geo. H. Cook of Rutgers College, State Geologist of New Jersey, called my attention to the carapace of a large crustacean in a mass of sandstone from the town of Andes, Delaware county, N. Y., which had been presented to the College Museum. At the same time Prof. Cook sent to me a plaster cast of the fossil, in relief, which preserved the characters of the surface in a remarkable degree of perfection.

I subsequently saw the original specimen in the museum of Rutgers College, and at a later period, through the kindness of the authorities of that institution, I have been allowed to have the specimens in my possession, for more critical examination and study.

The locality of the fossil is in the midst of the Catskill group, and the character of the rock alone indicates its geological horizon.

The specimens of the rock, one retaining the impression and the other the relief of the carapace, are more than two feet across, each one having a thickness of several inches. Although there are in one of the slabs some cavities partially filled with ferruginous matter, and other ferruginous markings, I have been unable to detect any evidence of organic remains in any part of the mass.

The rock, in its unweathered condition, is a fine-grained, olive-gray sandstone, weathering to a more distinctly gray color and becoming somewhat friable.

The accompanying description and illustration of the species will give an idea of the character of the fossil and its relations to its congeners previously known.*

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* The first published notice of this fossil, so far as I am aware, appeared in the Transactions of the New York Academy of Sciences (Vol. II, p. 8, Oct , 1882), by Prof. D. S. Martin, under the title of a new Eurypterid from the Catskill Group. The notice was based upon a cast of the carapace in the N. Y. State Museum of Natural History, which had been labeled with name and locality by the author. The printer's error in spelling the name Stylomurus instead of Stylonurus, would be readily corrected by any one at all familiar with this class of fossils.

GENUS STYLONURUS, PAGE 1856.

STYLONURUS EXCELSIOR, *n. sp.*

Plate V, fig. 1.

Carapace sub-elliptical, truncate behind; width at the base about two-thirds of the length; lateral margins gently curved outward from the base of the carapace to a point opposite the base of the palpebral arches, thence gradually incurving to the front of the carapace.

Eyes circular situated on a line just anterior to the center of the length; separated by a strong median ridge which, commencing nearly on a line with the posterior limits of the palpebral arches extends forward nearly one-half the distance to the anterior margin where it becomes merged in the general convexity of the surface; palpebral arches strongly elevated semi-circular, more regularly curving behind, where they are gradually depressed into the general contour; the anterior portion of the arch is narrower and terminates abruptly in a line almost through the center of the eyes; posterior angles of the carapace rounded; occipital ring moderately defined, anterior to which and separated by a transverse depression, is a central lobe with an intermediate and lateral lobe on each side with corresponding depressions.

Surface on the anterior part marked by strong elongate and confluent pustules which are arranged in concentric lines, becoming more individualized and directed backward and subimbricating on the posterior half; the markings on the occipital ring are more subdued than upon the general surface, except on the posterior margin which is ornamented by a row of strong spiniform nodes; the entire intermediate surface, as well as the surface of the nodes, is marked by fine scales; the surface included by the palpebral arches is marked by stronger scales which are not elevated into nodes; the concave spaces between the posterior lobes are marked only by the fine, scale-like ornamentation.

Abdomen and appendages unknown.

The greatest length of the carapace is two hundred and fifty-five millimetres; width at base one hundred and ninety-five millimetres; width in a line through the bases of the palpebral arches two hundred and twenty-five millimetres, and across the anterior extremities of the arches one hundred and ninety-three millimetres; the diameter of the eyes is twenty-three millimetres; distance between the extremities of the palpebral arches, sixty-five millimetres.

This species is very different from the ordinary forms of the genus in the great anterior extension of the carapace and the prominence of the palpebral arches.

A restoration on the scale of *Stylonurus Logani*, Woodward, would make the entire animal over four feet in length.

Formation and locality. In the Catskill group; Andes, Delaware county, N. Y.

LIST OF SPECIES OF FOSSILS FROM AN EXPOSURE OF THE UTICA SLATE AND ASSOCIATED ROCKS, WITHIN THE LIMITS OF THE CITY OF ALBANY.

BY C. E. BEECHER.

Climacograptus bicornis.
Dicranograptus ramosus.
Diplograptus mucronatus.
Crinoid stems.
Trematis terminalis.
Leptaena sericea.
" subtenta.
Orthis testudinaria.
Zygospira modesta.
Avicula Trentonensis.
Cleidophorus planulatus.
Ambonychia undata.
Tellinomyia dubia.
" levata.
Lyrodesma poststriatum.
Ten undetermined species of Lamellibranchiata.
Hyolithes Americanus.
" sp. ?
Bellerophon bilobatus.
" cancellatus.
Murchisonia gracilis.
Eudoceras proteiforme.
Orthoceras bilineatum ?
Cornulites flexuosus.
Plumulites sp.?
Triarthrus Becki.
Trinucleus concentricus.

Thirty-six species, several of which have not heretofore been noticed in the Utica Slate.

The well-known graptolite locality at Kenwood has been for a long time the only locality for fossils in the immediate vicinity of Albany, and has afforded but a single oboloid shell in addition to the graptolites. The discovery of strata furnishing an abundant and varied fauna is, therefore, of considerable interest.

The beds carrying these fossils are nearly vertical and situated north of the Dudley Observatory on the line of the New York Central railroad.

A CATALOGUE

OF THE

PUBLISHED WORKS OF JAMES HALL. LL.D.

1836–1882.

COMMUNICATED BY DR. DAVID MURRAY.

PART I.

BOOKS.

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1. Geology of New York. Part IV, comprising the survey of the Fourth Geological District; pp. 682, maps and plates. Albany, 1843. 4to.
2. Fremont's Exploring Expedition: Appendix A. Geological formations; pp. 295–303. B. Organic Remains; pp. 304–310, 4 plates. Washington, 1845. 8vo.
3. Palæontology of New York. Vol. 1; pp. xxiii, 338; plates, 100. Albany, 1847. 4to.
4. Report on the Geology of the Lake Superior Land District. By J. W. Foster and J. D. Whitney:
    - Lower Silurian System. Chapter 9, pp. 140–151. Washington, 1851. 8vo.
    - Upper Silurian and Devonian Series. Ibid. Chapter 10, pp. 152–166.
    - Description of New and Rare Species of Fossils from the Palæozoic Series. Ibid. Chapter 13, pp. 203–231.
    - Parallelism of the Palæozoic Deposits of Europe and America. Ibid. Chapter 18, pp. 285–318.
5. Stansbury's Expedition to the Great Salt Lake. Geology and Palæontology; pp. 401–414. Philadelphia, 1852. 8vo.
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10. Iowa Geological Survey. Supplement to vol. I, part II; pp. 1–4. 1859. 4to.
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    - Chapter I, Physical Geography and General Geology, pp. 1–72.
    - Chapter IX, Palæontology of Wisconsin; pp. 425–448.
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    - (Same as published in 1864 in advance for 18th Report and 20th Report, New York State Museum of Natural History, 1867, under title of "Account of Some New or Little Known Species of Fossils from Rocks of the Age of the Niagara Group," also in revised edition of same in 1870.)
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19. Descriptions of Crinoidea from the Waverly Group, James Hall and R. P. Whitfield. Ibid., pp. 162–179.
20. Illustrations of Devonian Fossils; 7 pages, 133 plates, with interleaved descriptions. Albany, 1876. 4to.
21. United States Geological Exploration of the Fortieth Parallel. Clarence King. Vol. IV. Ornithology and Palæontology; part II. Palæontology, James Hall and R. P. Whitfield; pages 199–302, 7 plates. Washington, 1877. 4to.
22. Palæontology of New York. Vol. V, pt. II, text pp. xv, 492, plates 120. Albany, 1879. 4to.

PART II.

SCIENTIFIC PAPERS PUBLISHED IN REPORTS, TRANSACTIONS OF SOCIETIES, JOURNALS, MAGAZINES, ETC.

N. B. — The title or an abstract only was given of papers in the list marked with an asterisk (*), as full notes were not furnished for publication.

1. Catalogue of Plants, Growing without Cultivation, in the Vicinity of Troy. John Wright and James Hall, 42 pages. Troy, 1836. 8vo.
2. Descriptions of two species of Trilobites, belonging to the genus PARADOXIDES. American Journal of Science and Arts. Vol. XXXIII, pp. 139–143. New Haven, 1837. 8vo.
3. Second Annual Report of the Fourth Geological District of New York. Assembly Doc. 200, pp. 287–373. Albany, 1838. 8vo.
4. Third Annual Report of the Fourth Geological District of the State of New York. Assembly Doc. 275, pp. 287–339. Albany, 1839. 8vo.
5. Fourth Annual Report of the Survey of the Fourth Geological District. Assembly Doc. 50, pp. 389–456. Albany, 1840. 8vo.
6. Fifth Annual Report of the Fourth Geological District. Assembly Doc. 150, pp. 149–180. Albany, 1841. 8vo.
7. Notes explanatory of a section from Cleveland, Ohio, to the Mississippi river, in a south-west direction, with remarks upon the Identity of the Western Formations with those of New York. Transactions of the Association of American Geologists and Naturalists; pp. 267–293. Boston, 1842. 8vo.
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9. Niagara Falls. Their physical changes and the Geology, and Topography of the surrounding country. Boston Journal of Natural History. Vol. IV, pp. 106–134. Boston, 1842. 8vo.
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12. * Ripple Marks and Casts of Furrows. Ibid. Vol. 45, pp. 148–149. New Haven, 1843. 8vo.
13. * Sections at Portage. Ibid. Vol. 45, pp. 329–330. New Haven, 1843. 8vo.
14. Address before the Society of Natural History of the Auburn Theological Seminary, 1843; pp. 1–20. Auburn, 1844. 8vo.
15. * Geographical Distribution of Fossils. American Journal of Science, vol. 47, pp. 117–118. New Haven, 1844. 8vo.
16. Description of Some Microscopic Shells from the Decomposing Marl Slate of Cincinnati. Ibid. Vol. 48, pp. 292–295. New Haven, 1845. 8vo.
17. Notice of the Geological Position of the Cranium of the Castoroides Ohioensis. Boston Journal of Natural History, vol. V, pp. 385–391. Boston, 1846. 8vo.
18. * On the supposed impression in Shale of the soft parts of an Orthoceras. Quar. Journal, Geological Society, London, vol. V, pp. 107–111. London, 1848. 8vo.
19. On the Parallelism of the Palæozoic Deposits of North America, with those of Europe; followed by a table of the species of fossils common to the two continents, with indication of the positions in which they occur, and terminated by a critical examination of each of these species; by Ed. de Verneuil (translated and condensed from the Bulletin of the Geological Society of France, 2d Ser., vol. IV). Am. Jour. Science and Arts. 2d Ser., vol. V, pp. 176–183, 359–370. New Haven, 1848. 8vo. Ibid. 2d Ser., vol. VII, pp. 45–51, 218–231. New Haven, 1849. 8vo.
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22. Catalogue of specimens in the Palæontological Department of the Geological Survey of New York. Ibid., 15 pages.
23. * Upon some of the Results of the Palæontological Investigations in the State of New York. Am. Jour. Sci., 2d. Ser., vol. V, pp. 243–249. New Haven, 1848. 8vo.
24. List of Minerals, Geological Specimens and Fossils, added to the collections, 1847, 1848. Second Ann. Report of State Cab. of Nat. Hist.; 4 pages. Albany, 1849. 8vo.
25. On the Trails and Tracks in the Sandstones of the Clinton Group of New York; their probable origin, etc.; and a comparison of some of them with Nereites and Myrianites. Proc. Am. Ass. Ad. Sci., 2d meeting (Cambridge), 1849, pp. 256–260. Boston, 1850. 8vo.
26. On the Brachiopoda of the Silurian Period; particularly the Leptænidae. Ibid., pp 347–350.
27. On Graptolites, their Duration in Geological Periods, and their Value in the Identification of Strata. Ibid., pp. 351–352.
28. Description of New Species of Fossils, and Observations upon some other Species previously not well known, from the Trenton Limestone. Third Ann. Report State Cab. Nat. Hist., pp. 167–175, 5 plates. Albany, 1850. 8vo.

29. * Remarks on the Geology of Mackinac, Drummond and St. Joseph's Islands and the Northern Shores of Lake Michigan. Proc. Am. Assoc. Ad. Sci., 4th meeting (New Haven), 1850, p. 354. Washington, 1851. 8vo.
30. * Report on the Invertebrate Fossils exhibited to the Association. Proc. Am. Assoc. Ad. Sci., 5th meeting (Cincinnati), 1851, p. 180. Washington, 1851. 8vo.
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32. * On the Silurian Rocks of the Lake Superior Land District. Ibid., pp. 64–66.
33. * Catalogue of specimens of the Rocks and Fossils in the Gray Sandstone, Medina Sandstone, Clinton Group, Niagara Group, Onondaga Salt Group, and a part of the Waterlime Group. 4th An. Rep. N. Y. St. Cab. Nat. Hist., pp. 119–146. Albany, 1851. 8vo.
34. On Drummond's Island. Proc. Am. Acad. Arts and Sciences, vol. II, pp. 253, 254. Boston, 1852.
35. * Comparison of the Geological Features of Tennessee with those of the State of New York. Proc. Am. Assoc. Ad. Sci., 6th meeting (Albany), 1851, pp. 256–259. Washington, 1852.
36. * Remarks upon the Fossil Corals of the Genus Favosites, and allied Fossil Genera Favistella, Astrocerium and others. Ibid., p. 306.
37. * On the Palæozoic Genera Trematopora, Cellepora, etc. Ibid., p. 306.
38. * Tracks, Trails, etc., in the Shales and Sandstones of the Clinton Group from Green Bay, with remarks on the thinning out and reappearing of this portion of the Clinton Group. Ibid., p. 306.
39. * Remarks on the Trilobite of the Potsdam Sandstone, named by Dr. Owen, *Dikellocephalus*, and its Relations to Asaphus and Ogygia. Ibid., p. 301.
40. * Remarks upon the Fossils of the Potsdam Sandstone. Ibid., p. 304.
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43. Report on Coal Lands in Kentucky, for the Kentucky Mining and Manufacturing Company. B. Silliman and J. Hall, pp. 16. New York, 1855. 8vo.
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45. * Remarks upon a Collection of Cretaceous Fossils from Nebraska, and the Absence of Species known in the Southern Extension of the Same Formation. Ibid., p. 290.

46. * Remarks upon the Results of Extensive and Continued Collections of Fossil Species from a Portion of the Silurian Rocks of New York, showing the Number of Species and Individuals of each Species Obtained from a Limited Locality during a Period of Ten Years. Ibid., p. 290.
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221. * Note upon the Genus Plumalina [Plumalites in error]. Proc. Am. Assoc. Ad. Sci., 31st meeting (Montreal), 1882, p. 419. Salem, 1883.
222. On the relations of Dictyophyton, Phragmodictyum and similar forms with Uphantænia. Ibid., p. 419.

PLATE I.

PLANORBIS EXACUTUS.

Page 51.

Figs. 1, 2. Side views of two specimens, showing the position and form of the aperture, × 9.

Fig. 3. A sinistral example, retaining but few of the characters pertaining to the species, × 9. *Swamp, Greenbush, N. Y.*

SOMATOGYRUS SUBGLOBOSUS.

Page 52.

Fig. 4. A shell presenting a carination around the upper portion of the volutions, and a narrow and angular aperture, × 3.

Mohawk river.

GILLIA ALTILIS.

Page 51.

Fig. 5. View of a biflexed specimen in which the three apical volutions are dextral and the fourth or outer volution is sinistral, × 9.

Hudson river, Albany, N. Y.

PHYSA ANCILLARIA.

Page 50.

Fig. 6. A specimen with an expanded aperture.

Fig. 7. An example in which the outer volution shows a tendency to uncoil, and the aperture to become circular.

Fig. 8. A deformed shell presenting a very deep sinus in the lower part of the aperture. All natural size. *Hudson river, Albany, N. Y.*

VALVATA TRICARINATA.

Page 51.

Fig. 9. A specimen with the volutions unrolled except at the apex, × 9.

Island creek, Albany, N. Y.

UNIO PRESSUS.

Page 52.

Fig. 10. A left valve, showing an unusually alated cardinal extremity, and absence of radiating bands on the outer great zone of growth.

Fig. 11. A small right valve of a specimen, showing two broad radiating undulations. The shell is also higher than normal forms.

Fig. 12. Left valve with the anterior portion narrow and auriculate, umbo oblique, and the wing much reduced. Natural size.

Normanskill.

UNIO CARIOSUS.

Page 52.

Fig. 13. A very gibbous left valve, narrowed in front and flattened on the ventral margins. Female; natural size.

Hudson river, Albany, N. Y.

FRESH WATER SHELLS.

94-7-6

State Mus. Nat. Hist. 36.

Plate 1

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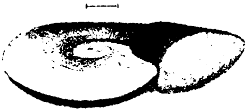

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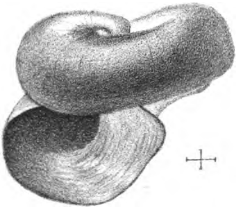

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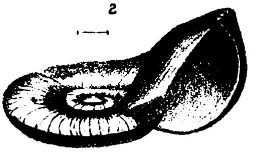

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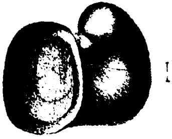

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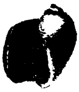

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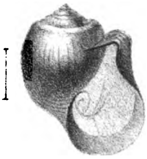

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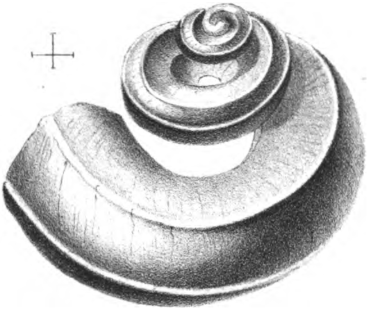

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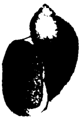

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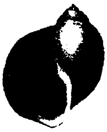

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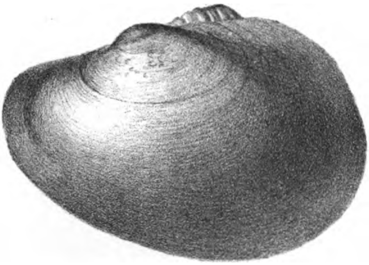

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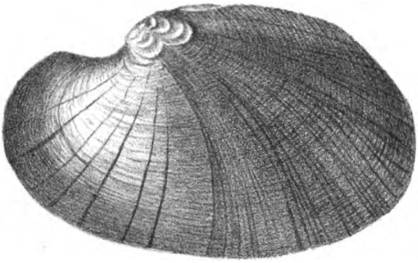

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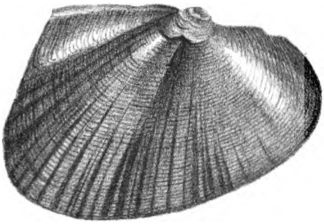

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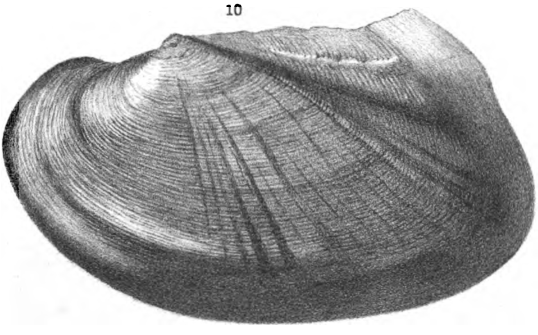

C.E. Beecher, del.

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PLATE II.

UNIO NASUTUS.

Page 52.

Fig. 1. Left valve of a female, showing plications of the shell produced by growth over the gills while distended with fry. Natural size.
Canal, *West Troy*, *N. Y.*

UNIO COMPLANATUS.

Page 53.

Fig. 2. A specimen presenting characters similar to the preceding, but showing two or more successive periods of impregnation. The general form of the shell is normal and may serve for comparison with the three following illustrations of unusual examples. *Canal*, *West Troy*, *N. Y.*

Fig. 3. A right valve having the umbo nearly central and with a strong sulcus on the anterior portion of the valve.
Canal, *West Troy*, *N. Y.*

Fig. 4. A very elongate cylindrical form.

Fig. 5. *Id.* Posterior view, showing the convexity of the valves.
Hudson river, *Albany*, *N. Y.*

Fig. 6. A wide, regularly elliptical specimen with large, prominent, rounded umbo which is situated just anterior to the middle of the cardinal line. Natural size. *Canal*, *West Troy*, *N. Y.*

FRESH WATER SHELLS.

State Mus. Nat. Hist. 36.

Plate 2.

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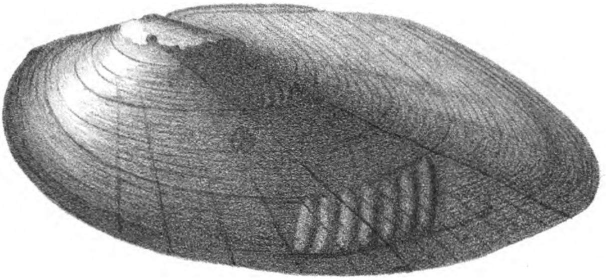

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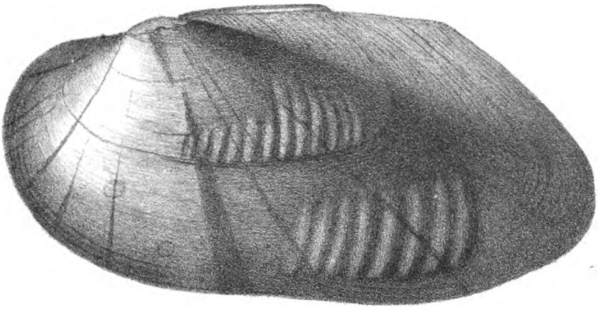

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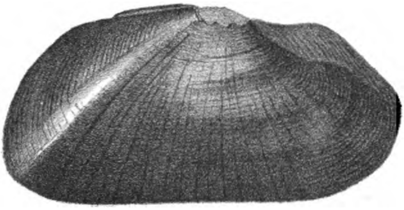

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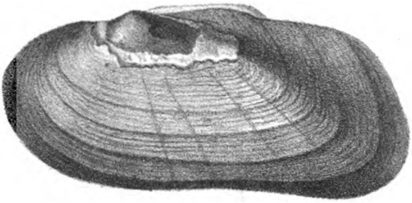

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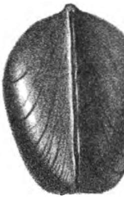

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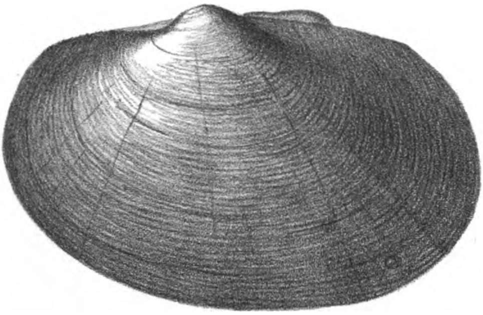

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PLATE III.

Platystrophia tricenaria.

Page 73.

Fig. 1. Horizontal section of a portion, including two of the radii, and showing the fibrous non-punctate character of the shell.

Platystrophia biforata.

Page 73.

Fig. 2. Showing the fibrous structure of the shell.

Platystrophia occidentalis.

Page 73.

Fig. 3. Similar to the preceding.

Platystrophia subquadrata.

Page 73.

Fig. 4. Section showing the fibrous structure of the shell, and the large scattered punctæ.

Platystrophia flabella.

Page 73.

Fig. 5. A section including two of the interradial areas. The lower right hand portion has been cut through to the surface of the shell and shows the concentric striæ.

Orthis perveta.

Page 73.

Fig. 6. Section showing the rows of minute punctæ.

Orthis Clytie.

Page 73.

Fig. 7. Showing the single and double rows of punctæ between the fibrous interspaces.

Orthis elegantula.

Page 73.

Fig. 8. Showing somewhat obscurely the broad rows of punctæ.

Fig. 9. Horizontal section of the shell through a varix of growth; the punctæ are partially obliterated by the action of the crystallization of iron pyrite.

FOSSIL BRACHIOPODA.

MICROSCOPIC STRUCTURE

State Mus. Nat. Hist. 36.

Plate 3.

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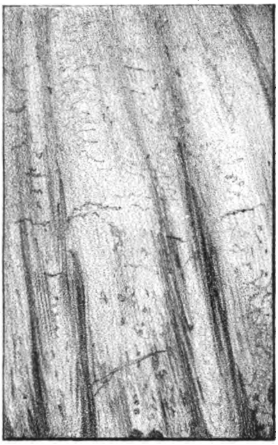

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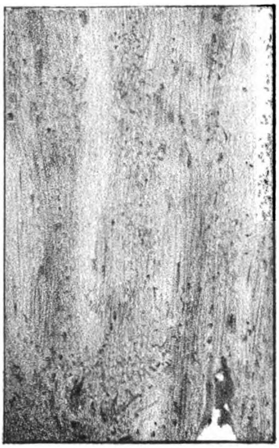

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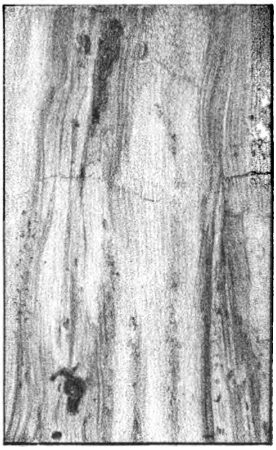

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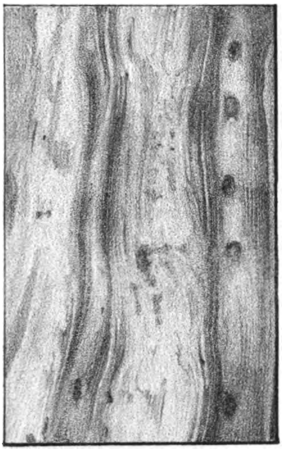

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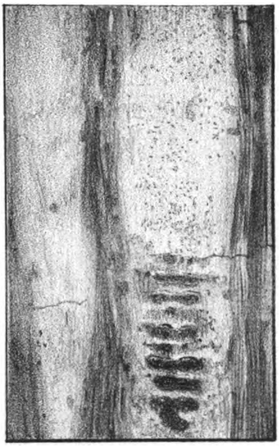

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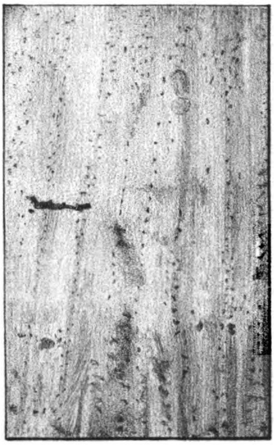

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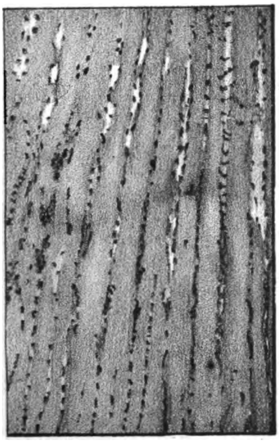

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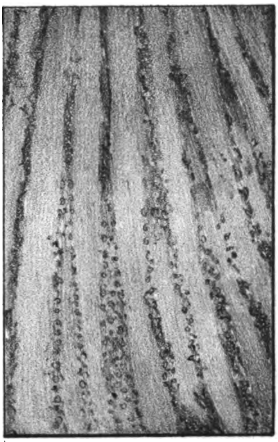

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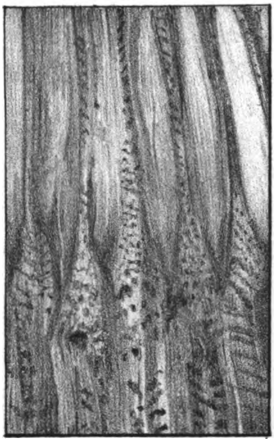

C.E. Beecher, photo.

Weed, Parsons & Co Albany, N.Y.

PLATE IV.

ORTHIS VANUXEMI.

Page 73.

Fig. 1. Vertical longitudinal section through a portion of the test, showing the laminæ of the shell and tubuli. Some of the tubuli bifurcate before reaching the surface.

Fig. 2. Vertical longitudinal section through the front of two valves, showing very distinctly the oblique laminæ and the size of the vertical tubuli.

Fig. 3. Horizontal section from near the surface, showing large and small punctæ.

Fig. 4. Section from near the center of a valve, showing the fibrous and punctate structure.

Fig. 5. Section at some depth below the surface, showing the regular rows of punctæ and flexuous direction of the fibres which run independently of the rows of punctæ.

ORTHIS PENELOPE.

Page 73.

Fig. 6. Horizontal section showing the very strongly marked rows of punctæ and intermediate fibrous structure.

SCHIZOPHORIA MULTISTRIATA.

Page 73.

Fig. 7. Showing the numerous minute punctæ and fibrous structure of the shell of this species.

SCHIZOPHORIA IOWENSIS.

Page 73.

Fig. 8. A section from near the surface, showing the numerous punctæ. In sections cut at a greater depth the appearance is similar in general features to fig. 9.

SCHIZOPHORIA TULLIENSIS.

Page 73.

Fig. 9. Showing the numerous close punctæ with no definite arrangement.

SCHIZOPHORIA IMPRESSA.

Page 73.

Fig. 10. Section from nearer the surface than the preceding, showing the broad bands of punctæ which gradually coalesce and produce an evenly punctate structure.

MICROSCOPIC STRUCTURE

State Mus.Nat.Hist.36.

Plate 4.

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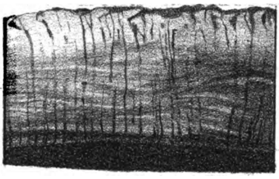

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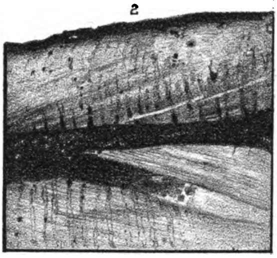

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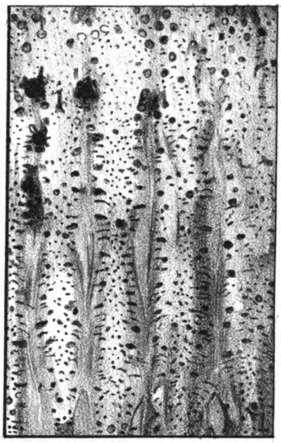

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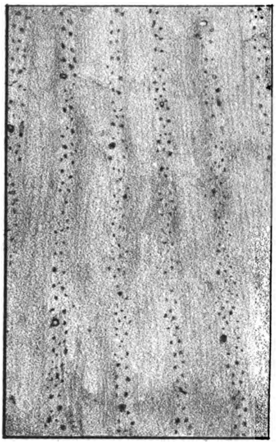

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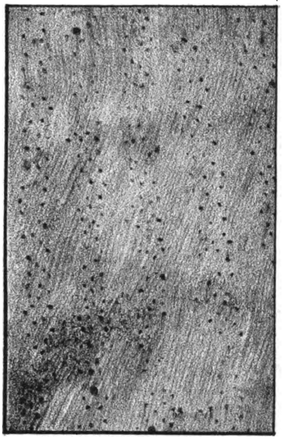

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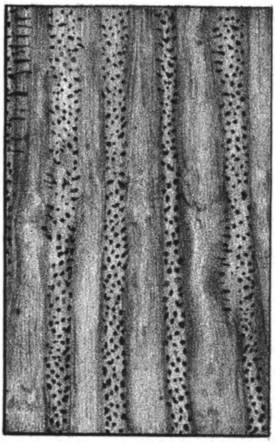

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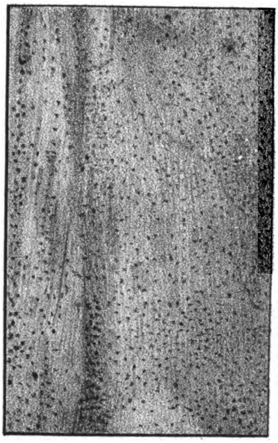

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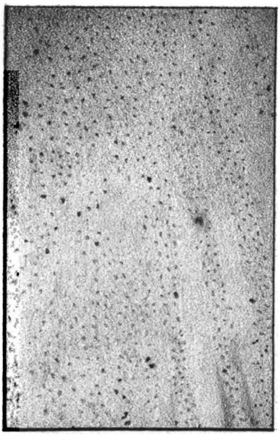

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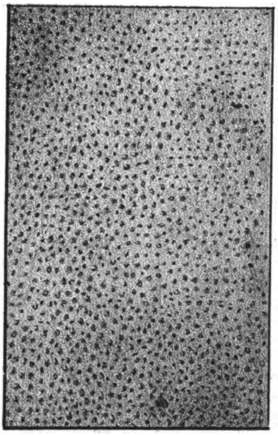

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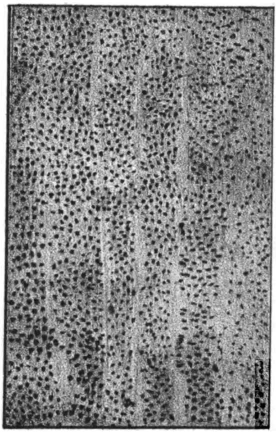

C.E.Beecher, photo.

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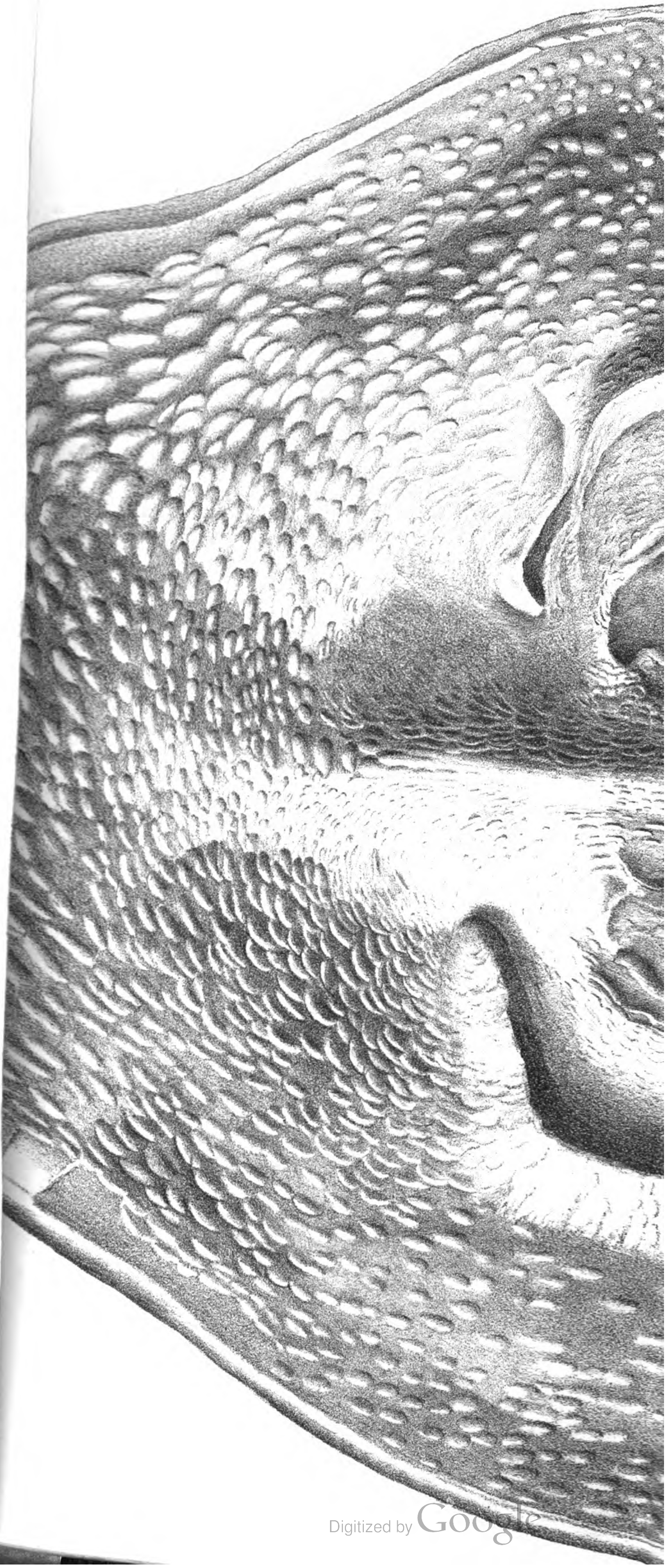
PLATE V.

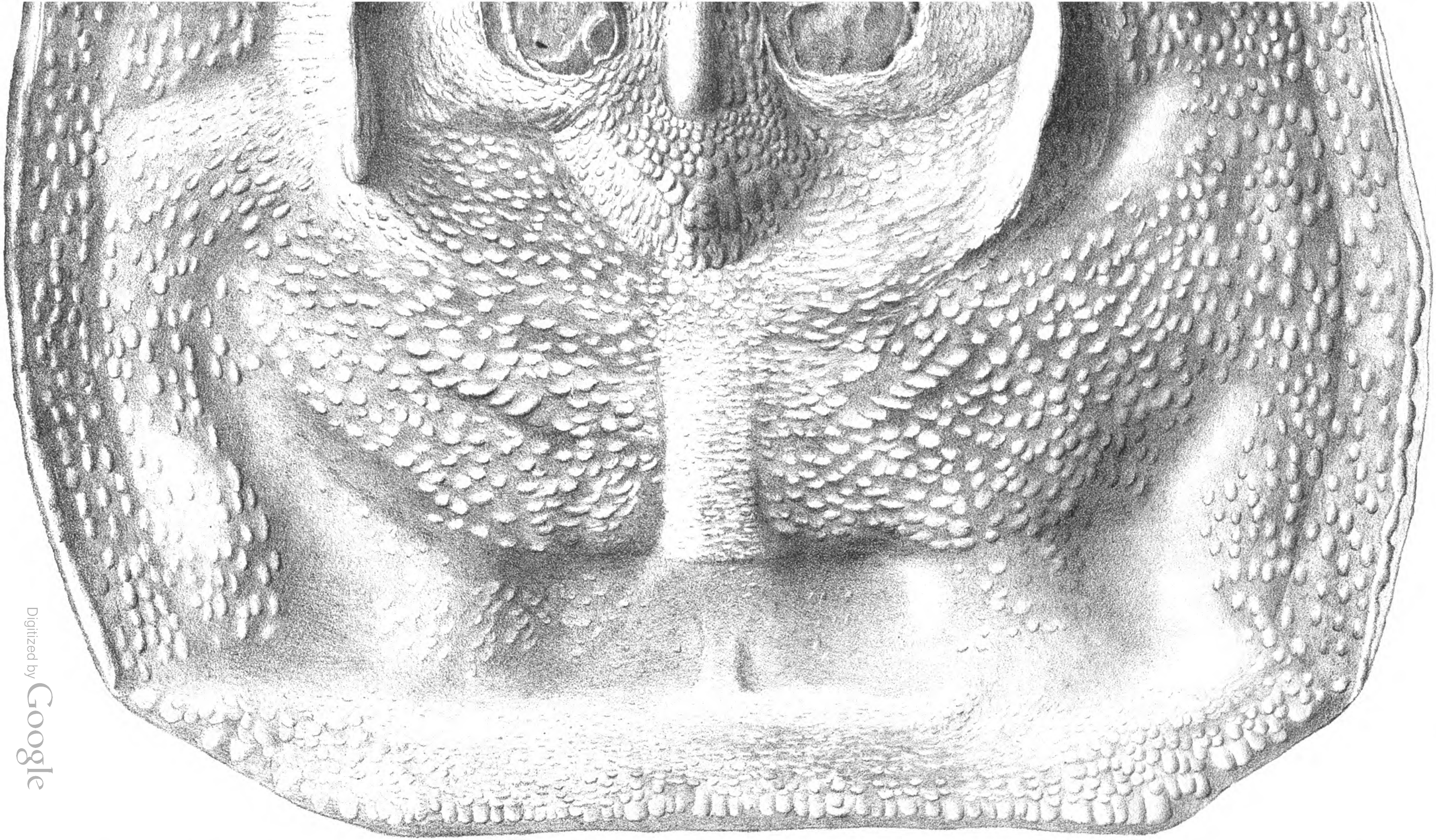
STYLONURUS EXCELSIOR.

Page 75.

View of the carapace described. The figure was drawn from a plaster cast taken from the matrix, as this portion preserved the markings of the test in a greater degree of perfection than the reverse or relief.

View o





E. Emmons. del et lith.

Weed, Parsons & Co Albany, NY

View of

PLATE VI.

CRYPTOZOÖN, *N. G.*

In the town of Greenfield, Saratoga county, there occurs a bed of limestone which presents a very remarkable appearance, the surface being nearly covered by closely-arranged circular or subcircular discs which are made up of concentric laminæ, closely resembling in general aspect the structure of Stromatopora. It very often happens that within these larger discs there occur two or more smaller ones, each with its own concentric structure and exterior limitation, and appearing as if budding from the parent mass. A farther examination shows that the entire form of these masses is hemispheric or turbinate, with the broadest face exposed upon the upper surface of the limestone layer; that their growth has begun from a point below and rapidly expanding upwards, has often extended one or two feet in diameter, as now shown upon the exposed surface of the limestone bed. At a single exposure on the farm of Mr. Hoyt, the surface of the limestone is covered by these bodies for many rods in extent. The entire area of the cellar beneath the house of Mr. Hoyt is upon this bed of limestone closely covered by these hemispheric masses with concentric structure. For a distance of one or two miles to the southward the outcrop of this limestone can be traced, and everywhere presenting the same characters in the presence of these masses. Large numbers of specimens of various sizes have been weathered out and lie scattered over the surface. This fossil has also been found at Little Falls, Herkimer county, N. Y.

These bodies have long been known under the name of Stromatoporá, from their general resemblance in form and structure to that fossil; but their position in reference to the bedding of the rock is uniformly the reverse of that of Stromatoporæ, which occur in the higher limestones, growing from a broad base which is covered by an epitheca, while these bodies under consideration grow upward and expand from a point below, while the convex surface is on the lower side. A careful examination of the nature of these bodies proves that while having the concentric structure common to Stromatopora they have not the regular succession of layers of tubuli characteristic of the species of that genus and cannot properly be included under that term. I, therefore, propose the term CRYPTOZOÖN as a designation for this peculiar form and mode of growth which will be more fully elucidated in the future.

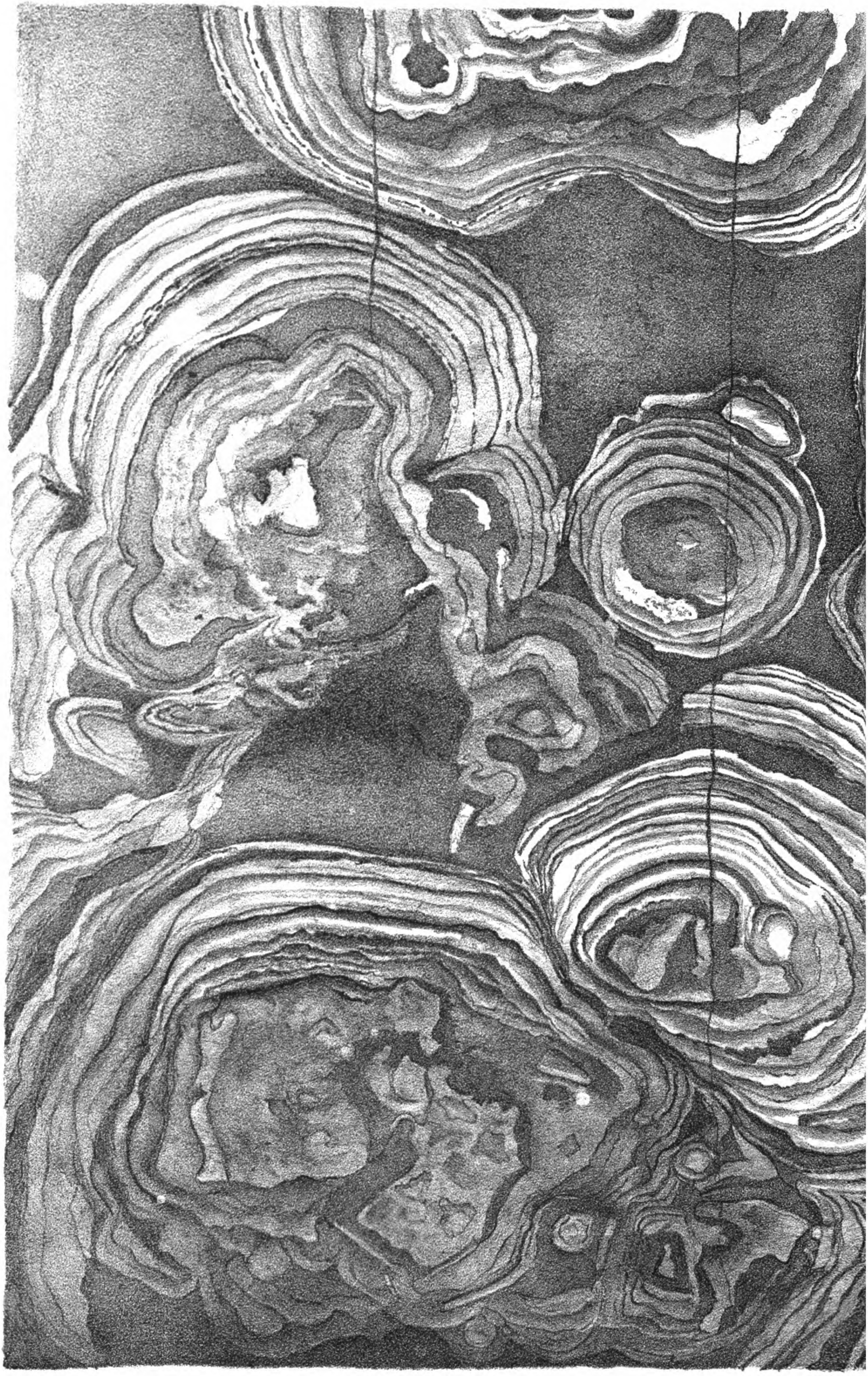
CRYPTOZOÖN PROLIFERUM, *n. sp.*

These bodies are made up of irregular, concentric laminæ of greater or less density and of very unequal thickness. The substance between the concentric lines, in well-preserved specimens, is traversed by numerous, minute, irregular canaliculi which branch and anastomose without regularity. The central portion of the masses are usually filled with crystalline, granular and oölitic material and many specimens show the intrusion of these extraneous and inorganic substances between the concentric laminæ. That these are intrusions, and not inclusions, is shown from the fact that they can be traced to a vertical fissure or break leading to the exterior of the fossil and which allowed the crystalline matter to enter.

State Mus. Nat. Hist. 36.

CALCIFEROUS

CRYPTOZOÖN P

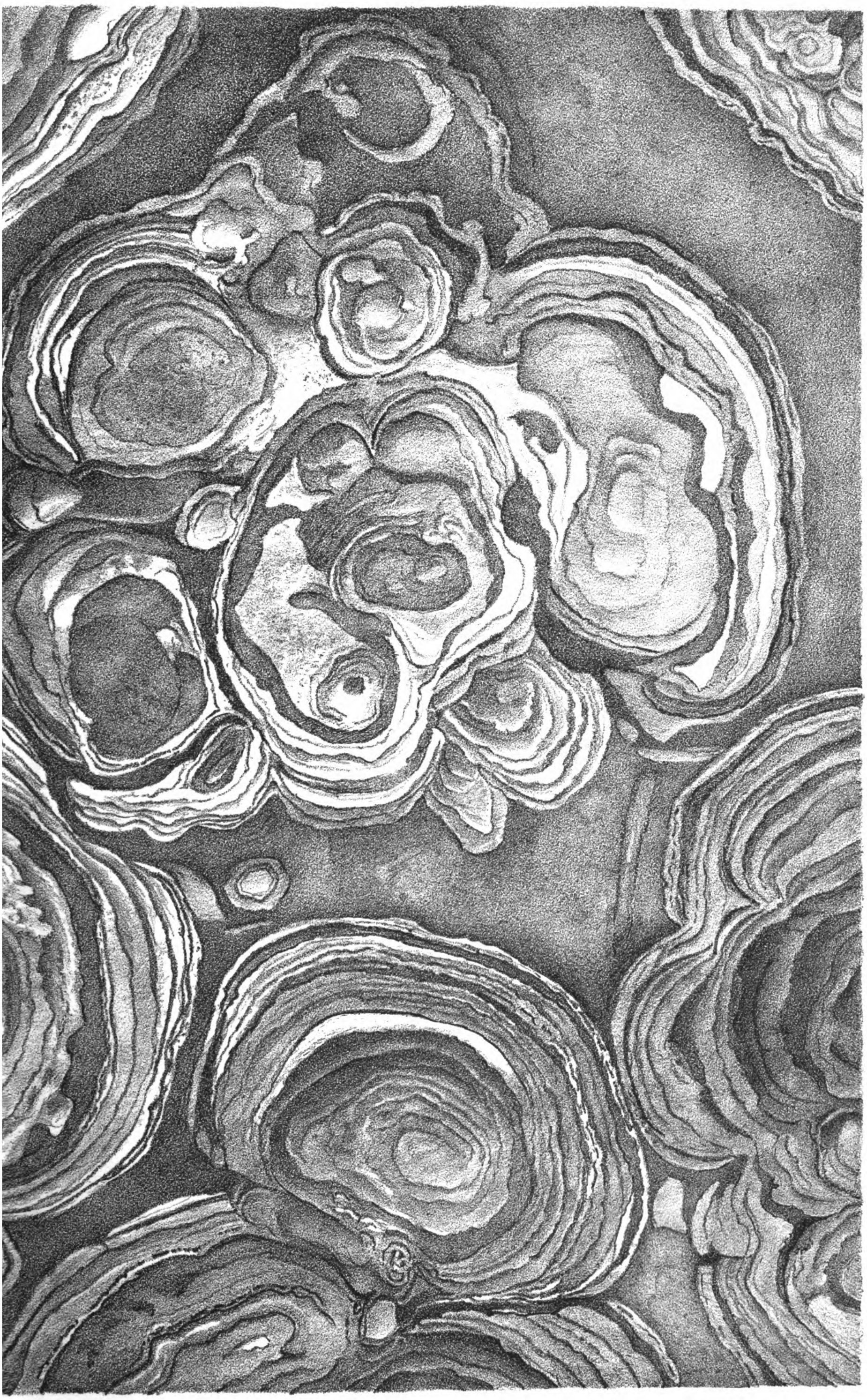


E. Emmons. lith.

SANDSTONE.

PROLIFERUM.

Plate 6.



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THIRTY-SEVENTH ANNUAL REPORT

ON THE

NEW YORK STATE MUSEUM OF NATURAL HISTORY,

BY THE

REGENTS OF THE UNIVERSITY

OF THE

STATE OF NEW YORK

TRANSMITTED TO THE LEGISLATURE JANUARY 10, 1884.

ALBANY:
WEED, PARSONS & COMPANY.
1884.

STATE OF NEW YORK.

No. 60.

IN SENATE,

January 10, 1884.

THIRTY-SEVENTH ANNUAL REPORT

OF THE STATE MUSEUM OF NATURAL HISTORY.

University of the State of New York,
Office of the Regents,
Trustees of the State Museum.

To the Legislature:

I have the honor to transmit herewith the Thirty-seventh Annual Report of the Trustees of the State Museum of Natural History, as required by law.

G. W. CLINTON.
Vice-Chancellor.

January 10, 1884.

CONTENTS.

Page.
Report of the Trustees of the State Museum of Natural History.. 7
A. Act to regulate the State Museum of Natural History and the publication of the Palæontology of the State......... 11
B. Contract between the State of New York by the Trustees of the State Museum of Natural History and Charles H. Van Benthuysen.................................. 12
C. Contract between the State of New York by the Trustees of the State Museum of Natural History and James Hall, State Geologist.................................. 16
Report of the Director of the Museum.................... ... 19
Current work of the Museum—general summary for 1883.... 25
Additions to the Museum during the year by donation and purchase.. 27
Appendix A—Catalogue of Translucent sections of Rocks and Fossils.. 33
Report of the State Entomologist........................... 47
Report of the State Botanist................................ 63
A. Plants mounted.. 66
B. Contributors and their contributions........... 68

REPORT.

To the Legislature:

The Regents of the University, as trustees of the State Museum of Natural History, respectfully submit their Thirty-seventh Annual Report, as required by law.

The act of the Legislature constituting chapter 355 of the Laws of 1883, imposed new and important duties on the trustees of the museum. They submit the following statement of their proceedings under this law.

The first section of this act directs the trustees to occupy the several rooms of the State Hall for the purposes of the museum as they may be vacated by the present occupants, and to fit up and prepare the rooms in a suitable manner, and to remove thither all the State collections. An appropriation of $20,000 was made for this purpose. Under this authority the trustees have occupied the basement for the storage of valuable plates belonging to the Palæontology, and for duplicate specimens. They have also used for temporary purposes the rooms in the second and third stories which have become vacant. But until a larger number of rooms in the building is vacated it has been found impossible to commence the work of fitting up the building. The trustees have requested Commissioner Perry to aid and advise them in the preparation of plans for the complete adaptation of the building for the museum. He has accordingly carefully studied the building and has had plans for the work prepared. The work of actual preparation will be begun as soon as any considerable portion of the building is vacated.

The second section of the act provides for a reorganization of the staff and work of the museum. In accordance with this section vesting all the appointments of the staff in the trustees, they reappointed all the members as follows:

Professor James Hall to be State Geologist and Director of the museum.

James W. Hall, general assistant in charge of the zöological department.

John Gebhard, special assistant and guide to the museum.

Charles E. Beecher, assistant in geology and palæontology.

Also they appointed for special departments in the museum the following, viz.:

J. A. Lintner, State Entomologist.

Charles H. Peck, State Botanist.

The trustees in further pursuance of this section have planned and arranged to carry out its purposes by instituting extensive exchanges and distributions of their duplicate specimens among the institutions of learning under the Board of Regents. This, however, can only be fully carried out when the duplicates of the collections are brought together in the new museum building. Under the resolution of the Legislature of 1881, collections of named and labeled specimens have been sent on application to the following academies:

1. Perry Union School, Perry, Wyoming county.
2. Baldwinsville Academy, Baldwinsville, Onondaga county.
3. Seymour Smith Academy, Pine Plains, Dutchess county.
4. Waterville Union School, Waterville, Oneida county.
5. Dreanan Literary Institute, Franklin, Delaware county.
6. Phelps Union and Classical School, Phelps, Ontario county.
7. Little Falls Union School, Little Falls, Herkimer county.
8. Port Byron Free School and Academy, Port Byron, Cayuga county.
9. Glens Falls Academy, Glens Falls, Warren county.
10. Weedsport Union School, Weedsport, Cayuga county.
11. Dryden Union School, Dryden, Tompkins county.
12. Olean Free School and Academy, Olean, Cattaraugus county.
13. Rutgers College, New Brunswick, New Jersey.
14. Warsaw Union School, Warsaw, Wyoming county.

The law provides that the trustees of the museum shall hereafter be authorized to print, under their own direction, the scientific papers prepared by the staff of the museum. As the increased appropriation called for by these enlarged duties has not yet become available, the trustees have been unable to enter upon the work of printing scientific papers. This they expect to undertake during the coming year, and they look forward with satisfaction to the prospect of issuing from the museum, from time to time, the important and valuable results of their investigations.

By the third section of the law the trustees are charged with the work of supervising the completion of the Palæontology. It is provided that one volume of the work shall be issued each year during five years, and that the completed work shall consist of those five volumes. The trustees, in preparing to execute this part of the law, found existing contracts for the printing and engraving required for this work. They sought the opinion of the Attorney-General as to the binding force of these contracts, and were advised that the contracts held by Charles Van Benthuysen & Sons were valid, and gave to them the right to execute the printing and engraving for the remaining volumes of the Natural History of the State. They obtained, however, extensive and advantageous modifications of the terms of these contracts, and executed a new and supplementary contract for the due execution of the work under the conditions imposed by the law.

They also made a contract with Professor James Hall for the execution of the drawings necessary for the plates to be engraved, and for the preparation of the text and explanations of the plates, and for the supervision of the work.

These contracts with Charles H. Van Benthuysen and with James Hall are herewith transmitted for the information of the Legislature.

Under these contracts the work of preparing a new volume of the Palæontology was resumed, and has been pushed forward with all possible speed. It is expected that this volume will be ready for delivery in February of the present year, and a second volume will be ready by January, 1885.

The volumes of the Palæontology owned by the State, and not yet sold or distributed, have been handed over to the custody of the trustees of the museum, and the proceeds of the sale of volumes are placed to the credit of the museum library.

The trustees in closing this report desire to make grateful mention of the several members of the museum staff, for the faithful and efficient manner in which they have performed their arduous duties.

We respectfully refer for a fuller account of the operations of the several departments of the museum, to the reports of the Director, and of the State Entomologist and State Botanist, which are herewith transmitted.

The value of the services of these officers will be particularly evident from the recital there given of their work. The State Entomologist has during the past summer been called upon to aid in the threatened invasion of the northern counties of the State by the chinch-bug, one of the most destructive pests of agriculture. The value of Professor Peck's contributions to botany is indicated by the constant demand received for copies of his contributions to the past annual reports of the museum.

Respectfully submitted,
G. W. CLINTON,
Vice-Chancellor.
DAVID MURRAY,
Secretary.

CONTRACTS.

An Act to regulate the State Museum of Natural History and the publication of the Palæontology of the State.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. For the purpose of providing sufficient and fire-proof accommodations for the collections of natural history belonging to the State, the Regents of the University, as trustees of the State Museum of Natural History, are hereby directed, in pursuance of the concurrent resolution of the Legislature, passed on the twenty-fourth day of March, eighteen hundred and eighty-one, to occupy, for the purposes of said museum, the several rooms of the State Hall as they may be vacated by their present occupants; and said trustees are hereby directed to fit up and prepare said rooms in a suitable manner, and to remove thither and arrange in order for exhibition, as soon as may be, the collections of said museum; said trustees shall also make provision for and remove to said State Hall, to be a part of said museum, all the fossils, minerals and other property of the State now in the charge of the State Geologist, in pursuance of the provisions of chapter two hundred and seventy of the laws of eighteen hundred and eighty-two; and the sum of twenty thousand dollars, or so much thereof as may be necessary, is hereby appropriated for the expenses of fitting up and removal, as provided in this section, to be paid on vouchers approved by said trustees.

§ 2. The scientific staff of the museum, to be appointed by said trustees, shall consist of a Director, who may also be State Geologist, and whose compensation shall be the same as now fixed by law, and of three assistants, together with such special assistants as may be necessary, whose compensation shall be fixed from time to time by said trustees, together with the State Geologist, State Entomologist and Botanist as these officers are now defined and provided for by law; and all the collections made by the members of said staff during their terms of service shall belong to and form a part of the collections of the museum; and the trustees of said museum shall be authorized to publish each year the scientific contributions of said staff and such other original scientific contributions as they may deem expedient, which publication shall be in lieu of the reports now required by law from the State Geologist and State Entomologist, and the scientific papers communicated each year to the Legislature along with the annual report of said trustees; and it shall be the duty of said trustees to distribute from the duplicate specimens of the museum to institutions of learning such collections as may be available and suitable for that purpose, as directed by a concurrent resolution of the Legislature passed on the fourteenth day of March, eighteen hundred and eighty-one, and to provide facilities in the museum for the study of its collections, and by means of printed hand-books describing said collections, and in such other ways as may be practicable, to make said museum a means of instruction to the citizens of the State. In order to provide for the expense of printing the aforesaid scientific publications and in order to increase the usefulness and efficiency of said museum as aforesaid, the annual appropriation to be made for its maintenance shall be fifteen thousand dollars, to be paid on vouchers approved by said trustees.

§ 3. The trustees of the State Museum of Natural History are hereby appointed to supervise the completion of the publication of the Palæontology of the State, to contract for the preparation and printing thereof, and to audit and certify to the expenditures therefor; and it is hereby provided that one volume of said Palæontology shall be published within one year from the execution of the contract for its preparation, that a second volume shall be published within two years, and that the entire work shall not extend beyond five bound volumes in addition to those already issued, all of which shall be published within five years from the passage of this act, and shall comprise the following subjects, that is to say, the *Lamellibranchiata* to be bound in two volumes, the *Bryozoans* to be bound in one volume, the *Brachiopoda* to be bound in one volume, and the *Crustacea, et cetera,* to be bound in one volume; and the sum of fifteen thousand dollars shall be appropriated annually for five years for the purposes of this section, payable on vouchers certified by said trustees; which sum of fifteen thousand dollars, or so much thereof as may be necessary, is hereby appropriated out of any money in the treasury not otherwise appropriated for the purpose of said publication for the current year.

§ 4. The volumes of the Natural History hereafter to be published, and the copies still remaining of the volumes already published, shall be in the charge of the trustees of said museum, who shall distribute and sell the same in accordance with the provisions of law now in force for such distribution and sale, and the proceeds of such sale said trustees shall use for the purpose of forming a suitable library for said museum, and they shall have authority to make exchanges with such portion of the volumes of said work as are not required for distribution or sale, and to receive donations and deposits of books and specimens on such terms as they shall deem advantageous for said museum.

CONTRACT BETWEEN THE STATE OF NEW YORK BY THE TRUSTEES OF THE STATE MUSEUM OF NATURAL HISTORY AND CHARLES H. VAN BENTHUYSEN.

Memorandum of agreement made this twenty-eighth day of July, 1883, between the State of New York, by the Regents of the University acting as trustees of the State Museum of Natural History, pursuant to chapter 355 of the Laws of 1883, and Charles H. Van Benthuysen, printer, of the city of Albany, witnesseth:

WHEREAS, The State of New York, by William C. Bouck, Governor, entered into a contract on the fourth day of April, 1843, with Thomas

B. Carroll and Alanson Cook, for printing and binding the Natural History of the State of New York, and on the twenty-seventh day of July, 1847, by John Young, Governor, entered into a contract with Richard H. Pease for the lithographic engravings of the drawings requisite for completing the Natural History of the State of New York; and

WHEREAS, On the fifth day of October, 1871, the State of New York, by Homer A. Nelson, Secretary of State, and Samuel B. Woolworth, Secretary of the Board of Regents acting pursuant to chapter 717 of the Laws of 1868, entered into a further contract with Charles Van Benthuysen, printer, of the city of Albany, assignee of the two aforesaid contracts for the continuation of the work to be performed in publishing the aforesaid Natural History; and

WHEREAS, The execution of the said contracts was transferred to the firm of Charles Van Benthuysen & Sons, composed of Charles Van Benthuysen, Charles H. Van Benthuysen and Arthur L. Van Benthuysen; and

WHEREAS, By the death of the said Charles and Arthur L. Van Benthuysen, the said Charles H. Van Benthuysen, as the survivor, has succeeded to the rights and obligations of said firm under said contract; and

WHEREAS, Elizabeth Root Van Benthuysen, widow and executrix of the will of late Charles Van Benthuysen, has by a writing hereon indorsed in behalf of herself and the estate consented to certain modifications of said contract hereinafter described,

Now, therefore, it is hereby agreed by the aforesaid trustees and Charles H. Van Benthuysen, his heirs and assigns, that the said Van Benthuysen shall execute, as hereinafter described, the work required under the aforesaid contracts for the publication of the remaining volumes of the Palæontology of the State, as defined in section three of chapter 355 of the Laws of 1883, and the publication of said volumes of Palæontology as therein defined, shall constitute the completion of the publication of the Natural History of the State of New York, as provided for by the aforesaid contracts; that is to say, the said Van Benthuysen shall print in letter-press the text of said Palæontology from good and clear type on paper of thirty-five pounds to the ream, and the explanations of the plates on paper of sixteen pounds to the ream, substantially as per samples herewith, and he shall execute in good style for said text to be printed therewith the wood cuts required for illustrations, not to exceed one hundred in all the volumes; he shall print in lithography the residue of the plates for said work, as hereinafter described, on Tileston's best plate paper, weighing eighty-five pounds to the ream, as per sample herewith, and he shall bind the said work in full cloth with title on back, and sides stamped in gold and black, and the printing, lithography and binding in style and execution shall be in all respects equal and conformable to those of the volume last published, entitled volume five, part two of Palæontology, except that no engraved title-page with vignette shall be required in any of the volumes hereafter to be printed; said work shall be printed in five volumes, three thousand copies of each, to contain in all not more than one thousand three hundred and seventy-five pages of text, together with the plates and explanations belonging thereto, said explanations to be printed, when the matter so requires, in double column or on both sides of the sheet; the volumes of said work shall consist as fixed by law of the following, that is to say:

There shall be two volumes on Lamellibranchiata, to contain together about four hundred and fifty pages of text and ninety-six plates, of which seventy-eight plates are already printed and are in the possession of said trustees, and eighteen plates, to contain three hundred and twenty-five figures, are to be lithographed and printed by said Van Benthuysen, for which there shall be printed also ninety-six leaves of explanations to face said plates; there shall be one volume on Bryozoa, to contain about three hundred pages of text, and sixty-eight plates, of which thirty-three plates have been printed and are now in the possession of the said trustees, and six plates, containing one hundred and twenty-seven figures, have been drawn on stone and are to be proved and printed, and twenty-seven plates, to contain five hundred and sixty-three figures, are to be lithographed and printed, and sixty-six leaves of explanations to face said plates are to be printed; there shall be one volume on Crustacea (including also matter Pteropoda and Cephalopoda), to contain about three hundred and twenty-five pages of text, and sixty-six plates, of which twenty-two plates have been printed and are now in the possession of said trustees, four plates, containing sixty-eight figures drawn on stone and proved, are to be printed, and forty plates, to contain five hundred and forty figures, are to be lithographed and printed, and sixty-six leaves of explanations to face said plates are to be printed; there shall be one volume on Brachiopoda, to contain about three hundred pages of text and fifty-seven plates, of which twenty-seven plates have been printed and are now in the possession of said trustees, and thirty plates, to contain nine hundred and five figures, are to be lithographed and printed, and fifty-seven leaves of explanations are to be printed; it is further agreed that said trustees shall furnish to said Van Benthuysen the drawings for the plates of the several volumes in such order and quantity as may be required for the due completion thereof, as hereinafter described, and the last of said drawings for each volume shall be furnished at least two months before the specified time of its delivery, all proofs of such plates to be approved by the said trustees or their authorized agent, and the printed sheets of said plates to be delivered to and receipted for by said trustees or agent; the said trustees shall also furnish, in a fair and legible condition, the manuscript copy in such quantity and at such times as will enable the said Van Benthuysen to comply with the terms of this agreement, the last installment of copy for each volume to be furnished at least two months before the time herein specified for the delivery of such volume; the said Van Benthuysen shall furnish one proof, three copies, and one revise, three copies, to be returned within four working days from receipt thereof. It is further agreed that said trustees shall furnish to said Van Benthuysen the copies of the printed plates for the several volumes in their possession as they may be required for binding, and said Van Benthuysen shall deliver to said trustees at the times herein specified three thousand copies of each of said volumes, containing the text, plates and explanations as hereinbefore described, provided that as one hundred copies of each of the plates of the Lamellibranchiata up to and including number eighty, except numbers thirty-five and forty-two, have been appropriated to use by said trustees, it shall constitute a full delivery on the part of the said Van Benthuysen, when he shall have delivered two thousand nine hundred complete copies of each of the two volumes of Lamellibranchiata and one hundred copies of a bound volume containing the text and the remaining plates; the times for the delivery of the several volumes herein specified shall be as follows, that is to say, the first volume on Lamellibranchiata not later than February 15, 1884; the second volume on Lamellibranchiata not later than January 1, 1885; the volume on Bryozoa not later than May 1, 1886; the volume on Crustacea, etc., not later than May 1, 1887, and the volume on Brachiopoda not later than August 1, 1888; it is further agreed that the said Van Benthuysen shall be paid from the treasury of the State for the work herein described as follows, that is to say, for the first volume on Lamellibranchiata, six thousand seven hundred and forty-four and thirty-six one-hundredths dollars; for the second volume on Lamellibranchiata, ten thousand four hundred and two and eighty-seven one-hundredths dollars; for the volume on Bryozoa, fifteen thousand and sixteen and twenty one-hundredths dollars; for the volume on Crustacea, etc., sixteen thousand nine hundred and thirty-two and eighty-eight one-hundredths dollars; and for the volume on Brachiopoda, fifteen thousand nine hundred and three and sixty-nine one-hundredths dollars; making a total of sixty-five thousand dollars, to be paid in the manner following, that is to say, for the work of lithography, as herein described, on the presentation from time to time of detailed bills in which the work executed for each separate volume shall be separately stated, he shall be paid for such work at the rate of eighty-eight per cent of the prices fixed in the contract made in 1871 between the State of New York and Charles Van Benthuysen; and on the completion of the printing and binding and the delivery of each of the several volumes, he shall be paid such further sum as when taken together with the sums paid for the lithography of such volume shall amount in the case of each volume to the aggregate sum hereinbefore specified for such volume; and said sums shall be in full payment for all the work done in pursuance of this agreement; it is further agreed in case the Legislature shall fail to make the appropriations for the continuance of the work herein described, or in case of the death or disability of the author or authors employed for its preparation, that the work shall be suspended and that all the parts of any volume or volumes which shall have been printed, together with the plates and explanations therefor, shall be delivered to the said trustees, and so far as appropriations may be available, payment shall be made for the same in accordance with the terms herein described, and the balance not so paid shall constitute a just claim against the treasury of the State.

In witness whereof and in pursuance of the authority conferred by the third section of chapter three hundred and fifty-five of the Laws of 1883, the Regents of the University, acting as trustees of the State Museum of Natural History, have

[L. S.] caused their common seal to be hereon impressed, and the Chancellor and Secretary have hereto subscribed their names, and the said Charles H. Van Benthuysen has also hereto subscribed his name and affixed his seal this twenty-eighth day of July, 1883.

(Signed) H. R. PIERSON,
Chancellor.
DAVID MURRAY,
Secretary.

CHARLES H. VAN BENTHUYSEN. [L. S.]

In consideration of the sum of one dollar in hand paid by the parties to the within contract, the receipt of which is hereby acknowledged, I hereby consent to the contract.

(Signed) E. R. VAN BENTHUYSEN. [L. S.]

CONTRACT BETWEEN THE STATE OF NEW YORK, BY THE TRUSTEES OF THE STATE MUSEUM OF NATURAL HISTORY, AND JAMES HALL, STATE GEOLOGIST.

Memorandum of agreement made and entered into this first day of September, A. D., 1883, by and between the people of the State of New York, by the Regents of the University of the State of New York, acting as Trustees of the State Museum of Natural History, pursuant to section three of chapter three hundred and fifty-five of the Laws of 1883, and James Hall, State Geologist, of the city of Albany.

Witnesseth, that whereas it is provided by said act that the trustees of the State Museum of Natural History shall supervise the completion of the publication of the Palæontology of the State; contract for the preparation and printing thereof, and audit and certify to the expenditures thereof, and that one volume of said Palæontology shall be published within one year from the execution of the contract for its preparation; that a second volume shall be published within two years, and that the entire work shall not extend beyond five bound volumes in addition to those already issued, all of which shall be published within five years from the passage of this act, and shall comprise the following subjects, that is to say, the *Lamellibranchiata*, to be bound in two volumes; the *Bryozoa*, to be bound in one volume; the *Brachiopoda*, to be bound in one volume, and the *Crustacea, et-cetera*, to be bound in one volume; now, therefore, it is hereby agreed by and between the parties aforesaid that the said Hall shall prepare and furnish all the text and description of plates required by each and all of the aforesaid volumes on Palæontology, and shall deliver the manuscript thereof in suitable installments and in a fair and legible condition to the printer, and shall correct and return within four working days the proof of the same as it may be delivered to him by the printer; that the said Hall shall also make or procure to be made by competent draughtsmen and furnish to the lithographer all the drawings of fossils which may be required for said volumes, and shall supervise the work of lithographing said drawings; shall inspect and approve the proofs of plates and the paper to be used in printing said plates, and shall receive from and receipt to said lithographer for the printed plates as they may be delivered to him; it is further agreed that the said Hall shall furnish to the printer the manuscript of the text and the drawings for the plates and the manuscript of the descriptions of the plates for the several volumes, in such order and within such reasonable time as may be required for the due printing and delivery of the same at the dates hereinafter fixed, the last installment of said manuscript of text and descriptions of plates and of said drawings for each of said volumes to be furnished to said printer not later than two months before the date so fixed; and that the dates of the delivery of the several volumes to the said trustees shall be as follows, that is to say, the first volume on *Lamellibranchiata* by the fifteenth day of February, 1884; the second volume on *Lamellibranchiata* by the first day of January, 1885; the volume on *Bryozoa* by the first day of May, 1886; the volume on *Crustacea, et cetera,* by the first day of May, 1887, and the volume on *Brachiopoda* by the first day of August, 1888; and it is further agreed that for the services as aforesaid the said Hall shall be paid as follows, that is to say, as compensation for authorship and including the correction of proof and the supervision of the drawing and lithography as herein described, the sum of twelve hundred dollars per annum for five years; as compensation for an assistant to be employed by the said Hall for the purpose of aiding in the preparation of said work a sum not to exceed one thousand dollars in any one year, to be paid on vouchers certified by said Hall; and as compensation for the execution of the drawings required for said volumes to be executed under his supervision and subject to his approval by persons to be employed by him, there shall be paid from time to time upon vouchers certified by him such sums as may be required, not to exceed in the aggregate for all the remaining drawings, three thousand dollars, and at a rate not to exceed on an average the sum of three and one-half dollars for each figure so drawn; and whereas, under chapter two hundred and seventy of the Laws of 1882, and under chapter two hundred and forty-three of the Laws of 1883, appropriations are made for James Hall as State Geologist for compensation for authorship and superintendence of drawings and engravings and for persons employed in making drawings, it is further covenanted and agreed that whatever sums are received from the State by the said Hall after the date hereof, on account of services for authorship and superintendence of drawings and engravings or for expenditures for persons employed in making drawings under the aforesaid acts, or under any future acts of appropriation available during the time of this contract, other than those in pursuance of said chapter three hundred and fifty-five of the Laws of 1883, first above referred to, shall be credited to the payments herein stipulated to be paid to said Hall for such services and expenditures, and shall be in place of payments made from the appropriations provided in and in pursuance of the aforesaid chapter three hundred and fifty-five of the Laws of 1883; and it is further agreed, in case the work herein described shall be suspended in consequence of the failure of the Legislature to make appropriations for its continuance, or for any other cause, that the said Hall shall deliver to the said trustees all the parts of the manuscripts of the text and descriptions of plates and of the drawings for said plates so far as the same have been prepared, and so far as appropriations may be available payment shall be made for the same in accordance with the terms herein described, and the balance not so paid shall constitute a just claim against the treasury of the State.

In witness whereof, and in pursuance of the authority conferred by the third section of chapter three hundred and fifty-five of the Laws of 1883, the Regents of the University, acting as trustees of the State Museum of Natural History; [L. S.] have caused their common seal to be hereon impressed, and the Chancellor and Secretary have hereto subscribed their names and the said James Hall has also hereto subscribed his name and affixed his seal this first day of September, 1883.

(Signed)

H. R. PIERSON,
Chancellor.
DAVID MURRAY,
Secretary.

JAMES HALL,
State Geologist. [L. S.]

REPORT OF THE DIRECTOR.

Albany, *January,* 1884.

To the Honorable the Board of Regents of the University of the State of New York:

Gentlemen — I have the honor to communicate herewith the annual report upon the State Museum of Natural History for the year 1883, being the thirty-seventh in consecutive order, together with a statement of the condition of the collections in the several departments, with the additions made thereto, and a general account of the work done in the institution during the past year.

Since the communication of the thirty-sixth report considerable progress has been made in the publication of the reports subsequent to the thirty-first. The thirty-second report had already been issued as a legislative document, but no copies have been published for the use of the Regents or of the museum. The thirty-third and thirty-fourth reports have been printed and delivered at the museum and State library for general distribution. The thirty-fifth report is nearly printed; already more than four hundred pages are in type and it will speedily be issued. This report will contain several scientific papers, which were communicated with the thirty-third and thirty-fourth reports, and will also include the several catalogues of shells which had been communicated with preceding reports and not heretofore printed. The thirty-sixth report will follow without delay, and we have reason to believe that within the present year the reports will be printed up to date. This work once accomplished will relieve the museum of much unpublished matter which has accumulated from year to year, and has left the actual work and condition of the museum unrepresented in the printed reports.

The collections of the museum have been preserved in their usual good order and condition, and all available space and facilities have been given to their exhibition. The anticipated early removal of the collections to the State Hall has rendered it undesirable to make any unusual plans for placing material on exhibition, which at best could only be of temporary service.

The skeleton of the whale mentioned in my two preceding reports has been received in good order and is now stored in one of the basement rooms of the State Hall. The specimen is ready for mounting and placing on exhibition as soon as a suitable place can be provided.

The collections of birds and mammals, formerly in charge of the Taxidermist, Mr. James A. Hurst, have, since the death of the latter, been placed in charge of Dr. J. W. Hall, assistant in the museum, who, for the past two years, has had entire charge of these collections. During the past month these collections have been removed from their cases, carefully cleaned and examined, and replaced in the cases in good order, and are all reported as entirely free from injurious insects. The skeletons of birds, fish and mammals have likewise received the proper treatment for their preservation and have been replaced in their proper cases. The alcoholic collections have also been critically examined, the jars refilled, and the whole restored to the cases in proper order.

Since the date of my last report the mineralogical collection has been removed from the shelves, the specimens and cases cleaned, and the minerals returned to their places. The geological collection in the wall cases has been likewise removed and properly cleaned and returned to their places. The catalogue of the mineralogical collection has been completed and will accompany this report.

The cleaning and rearrangement of this part of the museum collection has more clearly revealed the fact, which we knew before, that the collection of minerals, in its representation of New York localities, is far behind the discoveries of later years, and imperatively requires attention. I would recommend that some attention be given to improving this department of the collection. This can be most readily and economically done by the purchase of collections at the localities, or the employment of some person living on the ground where these minerals have been discovered and who will obtain them for a much less cost than can be done by sending collectors into the field.

The additions to the museum collections made during the year 1883 will be found recorded in detail in the lists appended.

In the botanical department specimens have been received from seven contributors.

In the collections of zoölogy and ethnology additions are recorded from eight contributors, and there are three contributors to miscellaneous collections.

To the collections of geology, mineralogy and palæontology specimens have been received from eleven contributors.

The library has received from all sources one hundred volumes and pamphlets ; of these, six have been purchased.

COLLECTIONS IN THE FIELD.

During the spring of 1883, the excavations made in cutting the West Shore railroad through the Utica and Hudson river slates at a point about three miles below Albany enabled the museum to secure a large collection of graptolites from these beds. The collection embraces several thousand specimens, and many of these are large slabs covered with these organisms. The black slates of this locality have conserved the organic remains in an unusual condition of perfection, compared with most of the localities of the slates in the Hudson valley. From this abundant and well-preserved material there may be obtained valuable data for an instructive paper of the graptolites, especially as to the development of the base or initial point of the organism.

The collection is so extensive in number of specimens that the museum may well supply to other similar institutions a share of its duplicates.

The Curator has considered it desirable to make some farther investigation in regard to the relations of the Oneonta sandstone and the underlying rocks, a problem of much importance in the geological record of the State, and one which requires still farther inquiry before a satisfactory determination can be made. Geological sections and collections were made in the counties of Delaware, Otsego, Chenango and Madison. These collections illustrate the order of succession among the strata in several localities, and will be of use in the final comparisons and determination of this question.

During the past summer it became necessary to verify some former observations upon the relations of the Niagara and Lower Helderberg groups, with the Hudson River group in the neighborhood of Catskill, which had heretofore been published in the New York reports, and which more recently had been controverted. The observations especially made sustain the views formerly published regarding the unconformability of the higher groups with the Hudson River group below, still leaving, however, a wide field for further investigation and the determination of many interesting questions regarding the geological dynamics of the periods named.

CURRENT WORK OF THE MUSEUM.

In addition to the current work pertaining to the care and preservation of the several collections of the museum, the catalogue, etc., as already mentioned, other work has been going on for the advancement of the museum collections.

The work of cutting translucent sections of fossils for mounting on glass, and of cutting and polishing other fossils for illustrating their structure, as well as cutting and shaping specimens for illustration and for placing in the cases, has been carried on as usual.

The total number of translucent sections of rocks and fossils cut and mounted on glass during the year is about 213. Specimens of fossils cut and shaped, ground for resting on shelf or block, and polished, number 360.

Taking advantage of our facilities for cutting and polishing specimens, the authorities of the normal school at Cortland sent to the museum a considerable number of specimens of fossils from their collections proposing that these be cut and polished, and the museum retain a part of the material thus acquired, as payment for the labor bestowed. The proposition was accepted and the work done; a part of the collection has been returned to the normal school at Cortland, and the museum retained forty-five specimens, which are enumerated in the list of additions to the museum collections. Both institutions have profited by this intercourse, and the Curator would be glad to extend to any of our educational institutions similar facilities.

An arrangement similar to the above has been made with E. B. Knapp, Esq., of the Skaneateles Library and Scientific Association, who has sent a considerable collection of cyathophylloid fossils for cutting, conditioned on receiving a portion of them in return, for the use of the Library Association. Since this arrangement will accrue to the advantage of students of natural science, the Curator has had no hesitation in making the agreement.

The entire collection of translucent sections of rocks and fossils, on glass slides, has been numbered and labeled; each section has the catalogue number and name written on the glass with a preparation of asphalt. A catalogue of these specimens, numbering more than two thousand, will accompany the present report as an appendix.

LAMELLIBRANCHIATA.

In the fossil Lamellibranchiata the duplicate specimens of the families PECTINIDÆ, PTERINIDÆ, AVICULIDÆ and MYTILIDÆ have been arranged and labeled preparatory for selection and distribution, and now await the publication of volume V, part 1 of the Palæontology of New York. The remainder of the collection of Lamellibranchiata will be arranged and labeled during the present year.

BRACHIOPODA.

The application of photo-micrography has been made to the illustration of the microscopical sections of the fossil Brachiopoda, prepared by Mr. C. E. Beecher, and has been carried on by him far enough to demonstrate its entire applicability to the objects sought to be accomplished. From what has already been done in this direction it is evident that the results are very important to the study and classification of the Brachiopoda, and that photography can be very successfully applied in the representation of the minute structure of fossil organisms.

Already something more than three hundred of these microscopic slides have been prepared, from which more than seventy photo-micrographic illustrations have been made. The negatives are the property of the State Museum. A print from each one will be mounted in a suitable book for study and reference, and, with the microscope slides will form the typical series for future reference in all studies of the Brachiopoda.

The success attending this experiment is already much greater than I could have expected, and I confidently anticipate that the coming year will show a greatly increased amount of material prepared, as well as improved results from the application of the photo-micrographic process.

DISTRIBUTION OF DUPLICATE COLLECTIONS.

Collections averaging one hundred species each have been sent to the following institutions:

Port Byron Free School and Academy.
Glens Falls Academy.

Weedsport Union School.
Dryden Union School.
Olean Free School and Academy.
Rutgers College, New Brunswick, New Jersey. In exchange.

I would be glad to recommend that some steps be taken to arrange, according to generic and specific order, the duplicate fossils of the museum collections. Many of these are now packed in boxes and are only accessible with difficulty whenever a small collection is desired for distribution to school or academy. In such difficulty it is natural to seek those most accessible, and in this manner we may often send away specimens in the smaller series which it would be desirable to reserve for more important collections.

The completion of volume V, part 1, on the Lamellibranchiata will enable us to give authentic names to a large number of these fossils. The collections from New York are much greater than from any other State in the Union, and the volume now in press will give a greater amount and variety of palæozoic forms than have yet been published in any country of America or Europe from the same formation.

I would beg leave to suggest that certain sets of these duplicates be set aside for exchange or presentation to some of the foremost museums in Europe. In either case, were these collections in the museums of Europe, it would lead to a clearer and higher appreciation of the work which we have done, and make the work still more emphatically one of authority in geological science.

Such a course would serve to open an intercourse between the State Museum and the more important museums of Europe, a feature which I feel will be an important one for ourselves and will serve to facilitate the future working of the institution.

I would also beg leave to call your attention to the fact that there are several very valuable collections in the State Museum which in case of loss could not be replaced. In view of the conceded unsafe condition of the present museum building, I would recommend that the following collections be at once removed to the State Hall and placed in some room of which the officers of the museum have entire control.

It is not necessary that these collections be displayed in cases, but they may be placed in closed cases or drawers until the new rooms shall be finished for their reception :

(*a.*) The typical series of specimens of the Cephalopoda, used in the preparation of volume V, part 2, of the Palæontology of New York. The collection numbers between eight and nine hundred specimens, and is partially arranged under glass and partially in drawers.

(*b.*) The collection of Gould's types of Mollusca.

(*c.*) The Emmons collection of crystallized minerals.

(*d.*) The Waldron series of Niagara fossils, of which many are types.

(*e.*) The collection of translucent sections of rocks and fossils, numbering more than three thousand specimens.

(*f.*) The typical collection of Gasteropoda and Pteropoda of volume V, part 2, Palæontology of New York, are in the custody of the Curator, as no available space has yet been assigned for their reception.

(*g.*) At the completion of volume V, part 1 (now in press), the extensive collections of Lamellibranchiate shells which have been used in the preparation of this work will be available for incorporation with State Museum collections.

GENERAL SUMMARY FOR 1883.

CURRENT WORK OF THE MUSEUM.

Transparent sections of rocks and fossils mounted on glass, about	225
Specimens of fossils shaped, cut, ground and polished, about	360
	585

Arranging and cataloguing the above sections.

Whale skeleton.— Completed, parts fitted and ready for mounting, at present stored under cover and in safety.

Geological surveys, sections and collections made in the counties of Delaware, Otsego, Chemung and Madison.

Arrangement and care of zoölogical collections, birds and mammals. The rearrangement, cleaning and numbering specimens in accordance with their present labels.

Records of library and of additions to the general collections.

Rearrangement, cleaning, etc., of collections of skeletons, and fish, both dry and alcoholic specimens.

Cleaning, ticketing and recording the general collection of minerals on second floor.

Arranging and cleaning the collection of New York minerals, already recorded.

Cleaning and arranging all geological collections and cases on first floor.

The *examination, analysis* or *partial analysis* of several hundred specimens, which are sent to the museum for the determination of the presence of gold or silver.

ADDITIONS TO THE STATE MUSEUM DURING THE YEAR 1883.

BY DONATION AND PURCHASE.

I. BOTANICAL.

1. *By donation.*

Specimens of the garden wache, *Atriplex hortensis*, L. From Mrs. S. M. Rust, Syracuse, N. Y.

Specimens of *Stellaria pubera*, Mx. and *Rhodora Canadensis*, L. From Mrs. I. B. Sampson, Albany, N. Y.

Specimens of three fungi, *Agaricus trullisatus*, Ellis; *Lenzites betulina*, Fr. and *Geaster hygro netricus*, Pers. From Mrs. C. M. Ferry, Oneida, N. Y.

Specimens of Herb Robert, *Geranium Robertianum*, L., with white flowers. From F. W. Battershall, Clyde, N. Y.

Specimens of ten species of fungi. From Professor W. G. Farlow, Cambridge, Mass.

Specimens of sixteen species of fungi. From A. B. Seymour, Cambridge, Mass.

Specimens of *Oidium irregulare*, Pk. From Wm. Trelcose, Madison, Wis.

Double branch of tree, one growing through the other. From Delavan Manning, Glenn, Montgomery county, N. Y.

II. ZOÖLOGICAL.

1. *By donation.*

One hundred specimens of sea shells from Point de Galle, island of Ceylon. From W. Stephen de Silva.

Piece of a pine board from the roof of the Emmanuel Baptist Church, mined by an insect — Xylocapa Virginica — the Virginia carpenter bee. From Wm. S. Wheeler, Albany, N. Y.

Australian bird. From Henry W. Koon, Poestenkill, Rensselaer county, N. Y.

Seven specimens of hawk eggs. From E. G. Nott, Buffalo, N. Y.

Specimen of Florida gallinule, shot about ten miles south of Schenectady. From Allen Dewitt Weaver, Albany, N. Y.

A live specimen of green heron, from August Rode, Bethlehem, Albany county, N. Y.

2. *By purchase.*

Skeleton of *Rorqualis borealis* or Fin-back whale.

III. GEOLOGICAL AND MINERALOGICAL.

1. *By donation.*

Nautilus,	*n. sp.*	Tully limestone,	Penn Yan,	N. Y.
"	"	"	"	"
Orthoceras,	*n. sp.*	"	"	"
Cyrtoceras,	*sp.?*	" ?	"	"

From Wm. Coon, Esq., and Wm. W. Buxton, Esq., Milo Centre, N. Y. Communicated through Mr. Berlin H. Wright, Penn Yan, N. Y.

Petrified wood from Dakota. From Miss Bessie Young, Troy, N. Y.

Eighteen specimens, mostly Stromatopora, Lower Helderberg group.

One specimen — Eridophyllum, Upper Helderberg group.

One specimen Chaetetes — Upper Coal Measures. From C. E. Beecher.

Four specimens of Pleurotomaria sulcomarginata.

Two specimens of Lamellibranchiata — specimens of Oneida conglomerate and tufa. From Mrs. E. M. Ferry, Oneida, N. Y.

Box of iron ore from Essex county, by collection by Prof. James Hall.

Crystal of Gypsum from Frank M. Greenwood, Newark, Wayne county, N. Y.

Compact talc from Gouverneur, N. Y. Used to adulterate paper. From Willard R. Fox, Albany, N. Y.

Specimen of oil-bearing rock. From C. V. Barse, Olean, N. Y.

Rose quartz and feldspar. From W. R. Derbey, Essex county, N. Y.

Two small specimens of Mexican onyx from New Capitol.

Two boulders of peculiar shape, one resembling a human foot, the other a vertebra. From Geo. House, Montgomery county, N. Y.

2. *By exchange.*

Three polished specimens, *Ammonites*, Inferior Oölite, France.

One polished specimen. *Nautilus*, Cretaceous, Alabama.

Twenty polished specimens, *Zaphrentis Halli*, Hamilton group, Skaneateles lake, N. Y.

Two polished specimens, *Heliophyllum Halli*, Hamilton group, Skaneateles lake, N. Y.

Three polished specimens, *Cystiphyllum Americanum*, Hamilton group, Skaneateles lake, N. Y.

Two polished specimens, *Amplexus*, ? Hamilton group, Skaneateles lake, N. Y.

Fourteen polished specimens, *Zaphrentis Canadensis*, Hudson River group, Cincinnati, Ohio.

Four sections on glass, *Calceola Sandalina*, Devonian, Eifel, Europe.

From the State Normal School at Cortland, N. Y., in exchange for the labor of cutting a series of specimens for the normal school.

3. *By purchase.*

Portion of tooth of fossil elephant, found near Chemung Narrows, N. Y.

IV. ARCHÆOLOGICAL AND ETHNOLOGICAL.

By donation.

Indian pestle (stone), Hannecroix creek, Coeymans, N. Y.

Brick imported from Holland between 1646 and 1670, used in the gable of a building at Coeymans, known as the "Castle."

Continental paper money, "fifteen shillings." From Alfred A. Sherman, Coeymans, N. Y.

Anchor taken from the reefs at the bottom of Lake Champlain, near Plattsburg, in the summer of 1882. From J. B. Groot, Albany.

V. TO THE LIBRARY.

1. *By donation and exchange.*

The Geological and Natural History Survey of Minnesota, Tenth Annual Report, N. H. Winchell, State Geologist.

Official Gazette, U. S. Patent Office, full series.

Department of Agriculture Special Report, Nos. 53 to 65, inclusive.

Department of Agriculture, Revision of Statutes, new series, Rept. No. 1, Oct. 1883.

Journal of the Cincinnati Society of Natural History, Vol. v, No. 4, December, 1882; Vol. VI, No. 1, April, 1883; Vol. VI No. 2, No. 3, October, 1883.

Report of Commissioners of Agriculture for 1882.

Frontiersmen of New York, two volumes, by J. R. Simms, Albany, 1882.

Bulletin of the American Geographical Society, Nos. 2 and 4, 1882; No. 1, 1883; Nos. 2 and 5, 1883.

Second Geological Survey of Pennsylvania, T. 2, Bedford and Fulton counties.

Second Geological Survey of Pennsylvania, C. 6, Philadelphia Belt.

Second Geological Survey of Pennsylvania, G. 6, Pike and Monroe counties.

Is Fingall's Cave Artificial, by F. Cope Whitehouse, M. A., December, 1882, pamphlet, 8vo.

United States Geographical Survey, Monograph ii; Tertiary History of the Grand Cañon Dist., with folio atlas of same.

Bulletin of United States Fish Commission, Vol. 1, 1881.

Journal of the American Geographical Society, Vol. 12, 1880.

Indiana Geology and Natural History, 1881; Eleventh Report of the State Geologist.

Department of the Interior, Bureau of Education, Circular of Information, Nos. 4, 5 and 6, 1882; Nos. 1 and 2, 1883; and High Schools for Girls in Sweden.

Decas plantacum novarum. Petropoli, 1882; from E. L. Regel.

Bulletin de la Société Impériale des Naturalistes de Moscow, Nos. 3 and 4, 1881, and No. 1, and No. 2, 1882, première livraison; No. 2, 1882, seconde livraison; 1881, No. 2.

Congrès Geologique International, Compte rendu 2d session, Bologne, 1881, pp. 158.

Table Générale et Systematique Matières contenues dans les premières, 56 volumes, 1829–1881.

Théses présenteés à la Faculté des Sciences de Lille, Université de France pour obtenir le grade de Docteur et sciences naturelles par Persifor Frazer, A. M., de Philadelphia, 1882.

The Pine Moth of Nantucket, by Samuel H. Scudder. Publications of the Massachusetts Society for the Promotion of Agriculture, Boston, 1883.

Sitzungsberichte und Abhandlungen der Naturwissenschaftlichen Gesellschaft. Isis in Dresden, Jahrgang, 1882, Juli bis December; Isis in Dresden, Jahrgang, 1883, Januar bis Juni.

Anales del Museo Nacional de Mexico. Tomo iii, Entrega 2, Mexico, 1883; Tomo iii, Entrega 3–a, Mexico, 1883.

Phrenological Journal, January, 1883, new series, Vol. 27, No. 1.

Answers to Inquiries about United States Bureau of Education, by Chas. Warren, M. D., 1883.

Proceedings of the Davenport Academy of Natural Sciences, Vol. III, part 3, 1879–1881.

Bulletin of American Museum of Natural History, Vol. 1, No. 4, May 1, 1883.

Annual Report (14th) American Museum of Natural History, May 1, 1883.

Smithsonian Miscellaneous Collections, 469. List of Foreign Correspondents to January, 1882; List of Foreign Correspondents, 490, volumes 22 to 27, inclusive. Additions and Corrections to List of Foreign Correspondents, to January, 1883.

Proceedings of the Canadian Institute, Toronto, Vol. 1, Fasciculus, No. 4 and 5, 1883.

Transactions of the Edinburgh Geological Society, Vol. 4, part II, October, 1882.

Catalogue of the Fossils of the Cincinnati group, by Joseph F. James, 1883.

Revision of the genus Clematis of the United States, by Joseph F. James, 1883.

Accessions to the Indian Museum, Appendix A, for quarter ending March 31, 1883. Calcutta.

Quarterly Journal, Boston Zoölogical Society; Vol. 2, No. 3, July, 1883.

Memoirs of the Boston Society of Natural History; Vol. 3, No. 7, June, 1883.

The Leading Business Men of Dakota cities, 1883.

Vögel von Borneo ün Südosten der Insel gesammelt von Hern, F. J. Grabowsky, Wien, 1883.

Dr. Platen's ornithologische sammlungen aus Amborna, Wien, 1882.

Journal of the Royal Geological Society of Ireland; Vol. XVI, pt. 2; Vol. VI, pt. 2 (new series), 1881, 1882.

Johns-Hopkins University, Baltimore, Studies from the Biological Laboratory; Vol. 2, No. 4, July, 1883.

XXIX and XXX Bericht des Vereines für Naturkunde zu Cassel, Kassel, 1883.

Annual Report of City Auditor of Boston for financial years 1882, 1883; No. 71 of series May 1, 1882, to April 30, 1883.

Report of the Commissioners of Education for 1881.

The Fossil White Ants of Colorado, by S. H. Scudder, October 10, 1883.

Transactions of Vassar Brothers Institute and its scientific section, Poughkeepsie, N. Y., 1881, 1883, Vol. 1.

Librairie ancienne de U. Hoepli Milan, Catalogue No. 17; Entomologie, etc., 1884.

Through the Smithsonian Institution :

Anales del Museo Nacional de Mexico Tomo III. Entrega 4a. (Number of Smithsonian, 16881.)

U. S. Geological and Geographical Survey of the Territories of Wyoming and Idaho, 1878, parts I and II; Hayden. (22154 and 22146.)

U. S. Geological Survey, J. W. Powell, Director.

Mineral Resources of the United States, Albert Williams, Jr., 1883. (22235).

Annual Report of the Secretary of the Interior on the Operations of the Department for the year ended June 30, 1881; Vol. III. (22171.)

No number or notice :

Second Annual Report of the United States Geological Survey to the Secretary of the Interior, 1880 and 1881. By J. W. Powell, Director.

Bulletin of the U. S. Geological Survey No. 1, Department of Interior.

United States Commission of Fish and Fisheries, Commissioners' Report, 1880.

Maps and Panoramas. Twelfth Annual Report of the U. S. Geological and Geographical Survey of the Territories, 1878.

2. *By purchase.*

Science, Vol. 1, Nos. 1 to 21, inclusive.
Science, Vol. 2, Nos. 22 to 45, inclusive, wanting No. 36.
American Journal of Science (wanting November number).
American Naturalist, full series.
Encyclopedia Britannica, Vols. 15–16.

APPENDIX A.

CATALOGUE OF TRANSLUCENT SECTIONS OF ROCKS AND FOSSILS.

LIST OF TRANSLUCENT SECTIONS OF ROCKS AND FOSSILS PREPARED AND MOUNTED ON GLASS, IN THE LABORATORY OF THE STATE MUSEUM OF NATURAL HISTORY.

No.	Name.	Formation.	Locality.
1, 2	Cryptozoön		Saratoga Co., N. Y.
3, 4	Cnemidium ramulosum		Wurtemberg.
5	Stromatopora	Coralline limestone	Schoharie, N. Y.
6	Serpentine and iron		Westchester Co., N. Y.
7, 8	Tentaculites	Tentaculite limestone	Schoharie, N. Y.
9	Stromatopora	Coralline limestone	Schoharie, N. Y.
10, 11	Stromatopora	Hamilton group	Iowa City, Ia.
12	Astylospongia	Niagara group	Tennessee.
13	Spirifera		
14	Astylospongia	Niagara group	
15, 16	Stromatopora	Coralline limestone	Schoharie, N. Y.
17, 18	Astylospongia		Tennessee.
19	Chætetes	Trenton limestone	
20	Favosites with crinoid stem	Lower Helderberg	
21	Cnemidium ramulosum		Wurtemberg.
22	Stromatopora	Hamilton group	Iowa City.
23	Astylospongia		
24	Fusulina	Upper Carboniferous	Missouri river.
25	Cnemidium		Wurtemberg.
26	Astræospongia	Niagara group	Tennessee.
27	Astræospongia	Niagara group	Tennessee.
28	Favosites Niagarensis	Niagara group	Lockport, N. Y.
29	Favosites Forbesi	Niagara group	Lockport, N. Y.
30, 31	Chætetes	Shaly limestone	Schoharie Co., N. Y.
32	Stromatopora	Gray limestone	Clarksville, N. Y.
33, 34	Sponge	Trenton limestone	Wisconsin.
35	Favosites Forbesi	Niagara group	Lockport, N. Y.
36	Sponge with crinoid stem	Lower Helderberg group.	
37	Stromatopora	Guelph limestone	Guelph, Canada.
38	Sponge Lower Helderberg		
39, 40	Sponge Trenton limestone		
41	Sponge Lower Helderberg		
42	Stromatopora	Hamilton group	Iowa.
43	Diphyphyllum	Hamilton group	
44	Cnemidium ramulosum		Wurtemberg.
45	Sponge	Lower Helderberg	
46, 47	Sponge	Upper Helderberg	
48	Stromatopora	Hamilton group	Iowa.
49	Diphyphyllum	Hamilton group	

No.	Name.	Formation.	Locality.
50, 51, 52	Streptelasma	Trenton limestone	
53, 54, 55	Streptelasma corniculum ? (Hall)		Cincinnati, O.
56	Chætetes	Trenton limestone	
57	Astræospongia	Niagara group	Tennessee.
58, 59	Streptelasma corniculum		Cincinnati, O.
60, 61, 62	Zaphrentis	Onondaga limestone	Schoharie, N. Y.
63	Chætetes	Trenton limestone (Geb. Coll.)	654
64, 65, 66	Columnaria	Black River limestone	
67, 68	Favosites	Hamilton group	Iowa City, Iowa.
69		Corniferous limestone	Schoharie, N. Y.
70, 71, 72	Michelinia	Hamilton group	York, Livingston Co., N. Y.
73, 74	Heliophyllum		Old No. 376 red ?
75, 76	Stromatocerium rugosum		Old No. 701
77, 78	Heliophyllum	Hamilton group	York, Livingston Co., N. Y.
79, 80, 81, 82	Stromatopora		Hackberry, Iowa.
83, 84	Stromatocerium		Old No. 701
85, 86	Heliophyllum		Western N. Y.
87, 88	Zaphrentis		Old No. 377
89	Zaphrentis		Schoharie, N. Y.
90, 91, 92, 93	Heliophyllum		Schoharie, N. Y.
94	Chætetes	Trenton limestone	
95, 96, 97	Zaphrentis		Iowa City.
98	Heliophyllum	Onondaga limestone	Schoharie, N. Y.
99	Heliophyllum ?		Old No. 379
100, '1, '2	No sections		
103	Phytopsis	Birdseye limestone	Watertown, N. Y.
104, 105	Phytopsis	Birdseye limestone	Fort Plain, N. Y.
106	Favosites	Coralline limestone	Schoharie, N. Y.
107	Favosites	Coralline limestone	Schoharie, N. Y.
108	Columnaria inequalis	Coralline limestone	Schoharie, N. Y.
109, 110	Phytopsis	Birdseye limestone	Fort Plain, N. Y.
111	Serpentine and calcite	Laurentian	Lewisburg, N. Y.
112	Eozoön Canadense	Laurentian	Canada.
113, 114	Spirifera mucronata (shell)	Hamilton group	
115, 116	Orthis Vanuxemi (shell)	Hamilton group	
117, 118	Athyris spiriferoides (shell)	Hamilton group	
119, 120	Strophodonta perplana		
121	Sponge?	Hudson River group	Barrytown, N. Y.
122	Phytopsis	Birdseye limestone	Fort Plain, N. Y.
123	Phytopsis	Birdseye limestone	Watertown, N. Y.
124	Phytopsis	Birdseye limestone	Fort Plain, N. Y
125	Tentaculites	Tentaculite limestone	Cherry Valley, N. Y.
126	Lignalite	Niagara group	Lockport, N. Y.
127, '8, '9	Trematopora ponderosa, Am. Mus., 202		Clarksville, N. Y.
130, 131	Callopora ponderosa, Am. Mus., 171		Clarksville, N. Y.
132, 133	Trematopora ponderosa, Am. Mus., 184		Clarksville, N. Y.
134	Favosites	Coralline limestone	
135	Serpentine, calcite, dolomite	Laurentian	Bolton, N. Y.
136	Sponge?	Hudson River group	Barrytown, N. Y.
137	Tentaculites		Cherry Valley, N. Y.
138, 139	Trematopora ponderosa, Am. Mus., 205		Catskill creek, N. Y.
140, 141	Beatricia	Hudson River group	
142	Chætetes (branching)	Lower Helderberg	
143	Trematopora ponderosa, Am. Mus., 221		Clarksville, N. Y.
144	Oölite	Calciferous	Saratoga.
145	Beatricia	Hudson River group	
146	Oölite	Calciferous	Saratoga.

No.	Name.	Formation.	Locality.
147	Cornulites (Tentaculites)	Richmondensis	
148	Tentaculites elongatus	Lower Helderberg	Port Jervis, N. Y.
149	Tentaculites	Black shale	Bristol Hollow.
150, '1, '2	Beatricia	Hudson River group	
153	Tentaculites		Cherry Valley, N. Y.
154, '5, '6	Beatricia	Hudson River group	
157	Bituminous calcite vein	Trent. lime	Flat creek, Spraker's Basin.
158	Caudi galli grit		Clarksville.
159	Tentaculites	Tentaculite limestone	Schoharie, N. Y.
160	Sponge?	Hudson River group	Barrytown, N. Y.
161		Hudson River group	Cincinnati, O.
162	Tentaculites	Upper Helderberg	Delaware, O.
163	Tentaculites		Ohio.
164	Tentaculites		
165, '6, '7, '8	No sections		
169		Hudson River group	
170	Tentaculites		
171	Cornulites (Tentaculites) Richmondensis		
172, '3, '4	Chætetes lycoperdon	Trenton limestone	Newport, N. Y.
175	Tentaculites spiculus		
176	No section		
177, 178	Foraminifera	Upper Helderberg	
179	Cone in cone	Portage group	Twenty-mile creek.
180	Stromatopora, with dolomite and quartz		
181	No section		
182, '3, '4, '5	Tentaculites ? styliola		
186, 187	No sections		
188–190 incl.	Favosites venustus	Niagara group	
191	Oölitic iron ore and Beyrichia	Clinton group	Wolcott, Wayne Co., N. Y.
192	Oölitic iron ore, Beyrichia and Bryozoans	Clinton group	Wolcott, Wayne Co., N. Y.
	No sections.		
200, '1, '2	Cyathophyllum	Hamilton group	Alden, N. Y.
203, 204			Livingston Co., N. Y.
205, 206	Heliophyllum		Darien, N. Y.
207	Favistella stellata	Hudson River group	Cincinnati, O.
208	Stromatopora (broken and destroyed)		Hackberry, Iowa.
209, '10, '11	Stromatopora		Hackberry, Iowa.
212	Stromatopora		Schoharie.
213	Stromatopora		
214	Stromatopora	Lockport ? (Pickett Coll.)	
215	Heliophyllum		Darien, N. Y.
216	Stromatopora		Hackberry, Iowa.
217	Stromatopora		Hackberry, Iowa.
218, '19, '20, '21	Stromatopora		Hackberry, Iowa.
222, 223	Stromatopora	Lower Pentamerus	New Scotland, N. Y.
224–31 incl.	Cryptozoön		3 m. W. Saratoga, N. Y.
232–35 incl.	Zaphrentis	Coralline limestone	Clarksville, N. Y.
236, 237	Zaphrentis	Corniferous	Schoharie, N. Y.
238, 239	Cystiphyllum		Western New York.
240, 241	Zaphrentis		Schoharie, N. Y.
242, '3, '4, '5	Eridophyllum	Upper Helderberg group	
246	Favistella	Hudson River group	
247–50 incl.	Chætetes	Hudson River group	Cincinnati, O.
251–4 incl.	Eridophyllum		Schoharie.

No.	Name.	Formation.	Locality.
255	Stromatopora		Lockport or Rochester.
256–61 incl.	Stromatopora		Hackberry, Iowa.
262–66 incl.	Chætetes		Canada.
267	Zaphrentis		Schoharie, N. Y.
268–71 incl.	Acervularia rugosa		Albany Co., N. Y.
272, 273	Favosites Emmonsi		Albany Co., N. Y.
274, '5, '6	Stromatopora		Iowa.
277, 278	Stromatopora		Iowa.
279–84 incl.	Chætetes	Trenton limestone	
285, '6, '7	Oölite		Schoharie, N. Y.
288, 289	Heliophyllum	Corniferous limestone	Clarksville, N. Y.
290–93 incl.	Stromatopora	Upper Helderberg (Pickett Coll.)	
294, 295	Chætetes	Trenton limestone	Middleville, N. Y.
297–300 incl.	Stromatopora	Niagara group	Skanandoa.
301, '2, '3	Heliophyllum Halli		York, Livingston Co., N. Y.
304, '5, '6	Stromatopora		Schoharie.
307, 308	Zaphrentis		Skaneateles lake, N. Y.
308, '9, '10, '11	Stromatopora		Schoharie.
312, 313	Cystiphyllum		Western New York.
314, '15, '16	Chætetes		Cincinnati.
317, '18, '19	Favosites Helderbergiæ		Schoharie, N. Y.
320, '1, '2, '3	Stromatopora		Schoharie, N. Y.
324, '5, '6	Favosites Emmonsi		Cherry Valley, N. Y.
327, 328	Zaphrentis		Skaneateles lake, N. Y.
330, '1, '2, '3	Favosites		Schoharie, N. Y.
334, '5, '6	Favosites Emmonsi		Schoharie, N. Y.
337 '8, '9	Diphyphyllum	Niagara group	Lockport, N. Y.
340, '1, '2, '3	Favosites		Cherry Valley.
344, '5, '6, '7	Zaphrentis		Cherry Valley.
348, '9, '50	Favosites		Clarke Co., Ind.
351, '2, '3	Favosites		Schoharie, N. Y.
354, '5, '6, '7	Monticulopora fibrosa	Hudson River group	Cincinnati, O.
358, '9, '60	Monticulopora dalii	Hudson River group	Cincinnati, O.
361, 362	Monticulopora mammulata	Hudson River group	Cincinnati, O.
363, 364	Stellipora antheloidea	Hudson River group	Cincinnati, O.
365, '6, '7, '8	Monticulopora sp. ?	Hudson River group	Cincinnati, O.
369, 370	Acervularia		Iowa.
371–75 incl.	Acervularia		Port Jervis, N. Y.
376, 377	Favosites		Port Jervis, N. Y.
378–82 incl.	Zaphrentis		Horn Rock, Skaneateles lake.
383–87 incl.	Zaphrentis		Delphi, N. Y.
388, 389	Cystiphyllum		Skaneateles lake.
390, 391	Zaphrentis		Skaneateles lake.
392, 393	Heliophyllum		Skaneateles lake.
394, '5, '6	Favosites		Cobleskill, N. Y.
397–401 incl.	Heliophyllum	Hamilton group	West Williams, Canada.
402–11 incl.	Cystiphyllum	Hamilton group	West Williams, Canada.
412, 413	Monticulopora ponderosa	Hudson River group	Cincinnati, O.
414, '15, '16	Dekayia attrita	Hudson River group	Cincinnati, O.
417, 418	Favosites		Port Jervis, N. Y.
419–22 incl.	Stromatopora		Port Jervis, N. Y.
423	Astylospongia inornata	Lower Helderberg	Schoharie, N. Y.
424, 425	Favosites minimus	Lower Helderberg	Schoharie, N. Y.
426–37	Tentaculites		Cherry Valley.
438, '9, '40	Zaphrentis Halli		Skaneateles lake.
441, '2, '3	Stromatopora		Schoharie, N. Y.
444, '5, '6	Halysites catenulata		Port Jervis, N. Y.

No.	Name.	Formation.	Locality.
447, '8, '9	Stromatopora granulifera,	Corn. limestone	Kelly's island.
450, '1, '2, '3	Stromatopora granulifera,	Corn. limestone	Falls of the Ohio.
454–58 incl.	Astylospongia inornata		Schoharie, N. Y.
459, 460	Diphyphyllum and Chætetes		Port Jervis, N. Y.
461–66 incl.	Favosites Niagarensis		Port Jervis, N. Y.
467, '8, '9	Zaphrentis Halli,	Hamilton group	York, Liv. Co., N. Y.
470, 471	Favosites venustus,	Niagara group	Lockport, N. Y.
472, 473	Chætetes,	Lower Helderberg	
474, 475	Cœnostroma incrustans		Rockford, Iowa.
476, 477	Stromatopora expansa		Rockford, Iowa.
478, 479	Favosites incrusted with Stromatopora		Schoharie, N. Y.
480, '1, '2	Favosites Helderbergiæ		Schoharie, N. Y.
483, 484	Favosites		Schoharie, N. Y.
485, 486	Caunopora planulata		Rockford.
487, 488	Houghtonia Huronica,	Hudson River group	Drummond's Isl.
489, '90, '91	Eozoön Canadense		Canada.
492	Chætetes fibrosa,	Trenton limestone	Trenton Falls, N. Y.
493	Streptelasma corniculum,	Hudson River group	Cincinnati, O.
494, 495	Favosites Emmonsi		Western New York.
496, '7, '8	Acervularia Davidsoni		Iowa City.
499, 500	Stromatopora		Schoharie.
501, '2, '3, '4	Favosites		Iowa City.
505, 506	Chætetes,	Corniferous lime	Lexington, Ind.
507, 508	Favosites,	Coralline limestone	Schoharie, N. Y.
509-514 incl.	Niagara limestone		Lockport, N. Y.
515-518 incl.	Heliophyllum		Darien, N. Y.
519, 520	Michelinia stylopor		Darien, N. Y.
521–526 incl.	Chætetes,	Lower Helderberg	Schoharie.
527–530 incl.	Heliophyllum		Canada.
531–534 incl.	Sponge,	Hudson River group	Turner Station, Ky.
535, '6, '7	Stromatopora		Town of Malden, Canada.
538–547 incl.	Astylospongia meniscus		Tennessee.
548–564 incl.	Cryptozoön		Greenfield, Saratoga Co.
565, '6, '7	Michelinia		Clarksville.
568,' 9, '70	Michelinia		Cherry Valley.
571, 572	Stromatopora		Sharon Hill.
573, 574	Michelinia		Cherry Valley.
575, 576	Heliophyllum,	Hamilton group	Darien, N. Y.
577–587 incl.	Favosites		Waldron, Ind.
588–600 incl.	Zaphrentis		Waynesville, O.
601-606 incl.	Heliophyllum		Little Traverse bay, L. Michigan.
607-610 incl.	Favosites		Waldron, Ind.
611–615 incl.	Chonophyllum magnificum		Falls of Ohio.
616	No section		
617	Favosites,	Hamilton group	Near Castleton, Ontario Co., N. Y.
618	Cystiphyllum		West Williams, Canada.
619	Heliophyllum,	Hamilton group	York, Liv. Co., N. Y.
620, '1, '2			Alden, Erie Co., N. Y.
623–642 incl.	Zaphrentis,	Hudson River group	Waynesville, O.
640–650 incl.	Stromatopora		Kelly's island.
651, '2, '3	Stromatopora		Kelly's island.
654, '5, '6, '7	Stromatopora,	Lower Helderberg	Delphi, N. Y.
658, '59, '60	Stromatopora minuta,	Niagara group	Pt. Detour, L. Michig'n.
661, '2, '3, '4, '5	Stromatopora (Syringostroma) sp.?	Hamilton group	W. N. Y.
666, '67, '68	Stromatopora var. foliculatum,	Lr. Heldbg.	Clarksville, N. Y.
669–673 incl.	Stromatopora		White's quarries, Malden, Canada.
674–681 incl.	Stromatopora		Loc.?

No.	Name.	Formation.	Locality.
682–689 incl.	Stromatopora		Iowa City, Iowa.
690–698 incl.	Stromatopora		Loc.?
699-701 incl.	Zaphrentis and Stromatopora		Loc.?
702–708 incl.	Stromatopora		Herkimer Co.
709–714 incl.	Stromatopora	Upper Pentamerus	Cumberland, Md.
715, 716	Same overgrowing Favosites		Cumberland, Md.
717-720 incl.	Stromatopora		Loc.?
721	Stromatopora	Coralline lime	Schoharie, N. Y.
722–725 incl.	Stromatopora		Loc.?
726–729 incl.	Stromatopora minuta	Niagara group	Louisville, Ky.
730–733 incl.	Crypoztoön		Saratoga Co., N. Y.
734–738 incl.	Stromotopora		Clarksville, N. Y.
739–742 incl.	Stromatopora		Kelly's island.
743–754 incl.	Stromatopora	Lower Pentamerus	Clarksville, N. Y.
755–761 incl.	Stromatopora		Little Traverse bay, L. Michigan.
762–766 incl.	Stromatopora		Sharon Hill, N. Y.
767–775 incl.	Stromatopora		Kelly's island.
776–779 incl.	Astylospongia bursa		Waldron, Ind.
780–788 incl.	Phytopsis	Birdseye limestone	Canajoharie, N. Y.
789–793 incl.	Cyathophyllum rugosum		Loc.?
794–798 incl.	Favosites		Cumberland, Md.
799–809 incl.	Columnaria		Schoharie, N. Y.
810–814 incl.	Niagara limestone		Lockport, N. Y.
815–825 incl.	Columnaria		Schoharie, N. Y.
826–831 incl.	Favosites	Coralline limestone	Schoharie, N. Y.
832–842 incl.	Columnaria		Schoharie, N. Y.
843	Columnaria		Loc.?
844–849 incl.	Columnaria	Coralline limestone	Schoharie, N. Y.
850–862 incl.	Stromatopora	Coralline limestone	Schoharie, N. Y.
863–876 incl.	Heliophyllum sp.?		r. r. t., 299, Canada West.
878, '79, '80	Favosites, Chætetes and Alveolites	Lower Pentamerus	
881–893 incl.	Styliola, etc.	Genesee slate—Limestone band, Iron bridge near Alden	
894–897 incl.	Stromatopora	Coralline limestone	Port Jervis.
898–902 incl.	Stromatopora		Crawfordsville, Ind.
903, '4, '5	Favosites		Thompson's lake.
906–914 incl.	Columnaria alveolata	Black River	
915, '16, '17	Favosites Forbesi	Niagara group	Waldron, Ind.
918–921 incl.	Alveolites	Hamilton group	Canada West.
922–929 incl.	Stromatopora constellata	Coralline lime	Schoharie, N. Y.
930, '31	Cyathophyllum rugosum	Corniferous	Falkirk, N. Y.
932, '3, '4, '5	Cyathophyllum rugosum	Corniferous	Clarksville, N. Y.
936, '7, '8	Favosites Forbesi	Niagara group	Waldron, Ind.
939–943 incl.	Fossil Wood	Tertiary	Virginia.
944–951 incl.	Favosites Forbesi		Waldron, Ind.
952–959 incl.	Favosites venustus		Iowa.
960–966 incl.	Trenton limestone		Saratoga.
967–973 incl.	Diphyphyllum	Niagara group	
974–978 incl.	Oölite		Iowa.
979–986 incl.	Astylospongia	Niagara group	Waldron, Ind.
987–992 incl.	Stromatocerium rugosum	Black River	
993, '4, '5	Zaphrentis		Clarksville.
996–1000 incl.	Lower Helderberg		Port Jervis.
1001, '2, '3	Stromatopora	Upper Helderberg	Williamsville, N. Y.
1004, 1005	Favosites	Upper Helderberg	Canada.
1006, 1007	Zaphrentis		Waynesville, O.
1008–1012 incl.	Zaphrentis	Hudson River group	Waynesville, O.

No.	Name.	Formation.	Locality.
1013, '14, '15	Syringostoma,	Corniferous limestone	Leroy, N. Y.
1016–1062 incl.	Heliophyllum Halli,	Hamilton group	Leroy, N. Y.
1063–1072 incl.	Zaphrentis Canadensis,	Hudson River group	Waynesville, O.
1073–1078 incl.	Chætetes lycoperdon		Middleville, N. Y.
1079–1095 incl.	Heliophyllum Halli,	Hamilton group	Leroy, N. Y.
1096–1099 incl.	Heliophyllum sp. ?	Hamilton group	Leroy, N. Y.
1100–1114 incl.	Heliophyllum sp. ?	Hamilton group	Leroy, N. Y.
1115, 1116	Heliophyllum Halli,	Hamilton group	Leroy, N. Y.
1117	Heliophyllum sp. ?	Hamilton group	Leroy, N. Y.
1118	Heliophyllum Halli,	Hamilton group	Leroy, N. Y.
1119		Trenton limestone	Saratoga.
1120–1125 incl.	Zaphrentis Canadensis,	Hudson River group	Waynesville, O.
1126–1137 incl.	Beatricia huronica		Jefferson, Ky.
1138–1146 incl.	Tetradium		
1147, 1148, '49	Heliophyllum,	Upper Helderberg	Clarksville.
1150–1154 incl.	Heliophyllum,	Upper Helderberg	Cherry Valley.
1155	Zaphrentis		Clarksville.
1156, 1157	Cystiphyllum,	Hamilton group	York, N. Y.
1158–1163 incl.	Zaphrentis Canadensis,	Hudson River group	Waynesville, O.
1164, '5, '6	Heliophyllum and Favosites,	Ham. group	E. Bethany, N. Y.
1167	Heliophyllum Halli,	Hamilton group	E. Bethany, N. Y.
1168–1175 incl.	Zaphrentis Canadensis,	Hudson River group	Waynesville, O.
1176	Heliophyllum Halli		Canada West.
1177–1180 incl.	Heliophyllum sp. ?		Near Avon, N. Y.
1181	Cystiphyllum,	Hamilton group	Canada.
1182	Cystiphyllum,	Hamilton group	Canada.
1183, 1184	Heliophyllum Halli		E. Bethany, N. Y.
1185, 1186	Cystiphyllum,	Hamilton group	West Williams, Canada.
1187, 1188	Cystiphyllum,	Hamilton group	Skaneateles lake.
1189, 1190	Heliophyllum		Skaneateles lake.
1191, 1192	Zaphrentis		Skaneateles lake.
1193–1197 incl.	Heliophyllum		E. Bethany, N. Y.
1198–1200 incl.	Zaphrentis,	Upper Helderberg	Cherry Valley.
1201, 1202	Cystiphyllum Americanum,	Hamilton group	Moscow, N. Y.
1203–1207 incl.	Heliophyllum sp. ?.		Darien, N. Y.
1208–1212 incl.	Zaphrentis Canadensis,	Hudson River group	Richmond, Ind.
1213, 1214	Heliophyllum,	Hamilton group	West Williams, Canada.
1215–1230 incl.	Zaphrentis Canadensis		Waynesville, O.
1231–1237 incl.	Heliophyllum sp. ?	Hamilton group	Bosanquet, Canada.
1238, '39, '40	Heliophyllum,	Hamilton group	Little Traverse bay, L. Mich.
1241, '42, '43	Heliophyllum sp. ?	Hamilton group	Little Traverse bay, L. Mich.
1244–1252 incl.	Zaphrentis Canadensis		Richmond, Ind.
1253, '4, '5, '6	Heliophyllum,	Hamilton group	York, N. Y.
1257–1261 incl.	Clisiophyllum		Clarksville, N. Y.
1262–1275 incl.	Heliophyllum,	Hamilton group	Darien, N. Y.
1276–1280 incl.	Heliophyllum,	Hamilton group	Near Leroy, N. Y.
1281–1289 incl.	Heliophyllum Halli,	Hamilton group	Near Leroy, N. Y.
1290	Zaphrentis,	Upper Helderberg	
1291, '2, '3	Marble		Hampton point. ?
1294–98 incl.	Fragments of shells,	Clinton group	
1299	Campophyllum,	Hamilton group	Iowa City.
1300	Cystiphyllum Americanum,	Hamilton group	W. New York.
1301	Stromatopora?	Upper Helderberg	Kelly's island.
1302–8 incl.	Foraminifera,	Upper Helderberg	Kelly's island.
1309–37 incl.	Acervularia,	Upper Helderberg	Kelly's island.
1338–42 incl.	Diphyphyllum,	Upper Helderberg	Kelly's island.
1343–48 incl.	Acervularia,	Hamilton group	Little Traverse bay, L. Mich.

No.	Name. Formation.	Locality.
1349, '50	Favosites, Corniferous limestone	Falkirk, N. Y.
1351–56 incl.	Niagara limestone	Lockport, N. Y.
1357, '8, '9	Eridophyllum, Corniferous limestone	Clarksville, N. Y.
1360–64 incl.	Favosites Emmonsi, Corniferous limestone	Clarksville, N. Y.
1365, '6, '7	Favosites hemispherica	Clarksville, N. Y.
1368, '69, '70	Chætetes, Upper Helderberg	Kelly's island, O.
1371, '2, '3, '4	Astylospongia inornata, Lower Helderberg	Clarksville, N. Y.
1375–79 incl.	Syringopora, Upper Helderberg	Kelly's island, O.
1380, '81	Astylospongia præmorsa	Waldron, Ind.
1382–87 incl.	Syringopora, Upper Helderberg	Cherry Valley, N. Y.
1388, '89, '90	Stromatopora, Coralline limestone	Schoharie. N. Y.
1391, '92	Stromatopora constellata, Coralline limestone	Schoharie, N. Y.
1393-1411 incl.	Columnaria alveolata, Black River lime	Lake Champlain.
1412–17 incl.	Acervularia, Corniferous lime	Clark Co., Ind,
1418, '19	Tentaculite limestone	Schoharie, N. Y.
1420–28 incl.	Stromatocerium rugosum, Black River lime	Lake Champlain.
1429–33 incl.	Stromatocerium with Columnaria alveolata	Lake Champlain.
1434, '35, '36 to '40	Favosites Niagarensis	Schoharie.
1441	Favosites venustus	Schoharie.
1442–51 incl.	Columnaria inequalis, Coralline limestone	Schoharie.
1452, '3, '4	Halysites catenulatus, Coralline limestone	Schoharie.
1455–60 incl.	Halysites catenulatus, Coralline limestone	Schoharie.
1461, '2, '3, '4	Heliophyllum, Upper Helderberg	Clarksville.
1465, '66	Tetradium, Hudson River group	Shore Lake Ontario.
1467–74 incl.	Tetradium, Trenton group	Albany, Ga.
1475–79 incl.	Favosites Emmonsi, Upper Helderberg	Clarksville, N. Y.
1480–84 incl.	Favosites hemisphericus, Upper Helderberg	Clarksville, N. Y.
1485–88 incl.	Calcite	Mammoth cave, Ky.
1489, '90, '91	Niagara limestone	Lockport, N. Y.
1492, '93	Encrinal limestone	
1494-1501 incl.	Chætetes lycoperdon, Trenton limestone	New York.
1502, '3, '4, '5, '6	Chætetes lycoperdon, Trenton limestone	Trenton Falls.
1507, '8	Chætetes lycoperdon (loose specimen)	Helderberg mts.
1509–13 incl.	Chætetes, Hudson River group (Pickett Coll.).	
1514	Heliophyllum, Upper Helderberg	Falkirk, N. Y.
1515–20 incl.	Recent coral	
1521, '2, '3, '4	Chætetes lycoperdon, Trenton lime	Middleville, N. Y.
1525, '6, '7 to '30	Cryptozoön, Calciferous (loose)	Schoharie, N. Y.
1531, '2, '3	Chætetes, Corniferous lime	Kelly's island.
1534–41 incl.	Niagara limestone	Lockport, N. Y.
1542–46 incl.	Zaphrentis Canadensis, Hudson River group	Drummond's Isl.
1547–55 incl.	Cyathophyllum rugosum, Upper Helderberg	Thompson's lake.
1556–72 incl.	Favosites venustus, Niagara group	
1573–77 incl.	Monticulipora, Hudson River group	Waynesville, Ohio.
1578–82 incl.	Astylospongia inornata, Lower Helderberg	Schoharie, N. Y.
1583–87 incl.	Tetradium, Birdseye limestone	Little Falls, N. Y.
1588–99 incl.	Upper Helderberg limestone	Clarksville, N. Y.
1600–5 incl.	Tentaculite limestone	Indian Ladder, N. Y.
1606–11 incl.	Acervularia, Hamilton group	West Williams, Canada.
1612–15 incl.	Astylospongia inornata, Lower Helderberg	Clarksville, N. Y.
1616, '17, '18	Michelinia	
1619, '20, '21	Corniferous limestone	Leroy, N. Y.
1622–32 incl.	Acervularia, Corniferous lime	Kelly's island.
1633, '34	Chætetes	Kelly's island.
1635–53 incl.	Tetradium, Trenton limestone	
1654–68 incl.	Corniferous limestone	Clarksville, N. Y.
1669–73 incl.	Cyathophyllum rugosum, Upper Helderberg	Clarksville, N. Y.

No.	Name.	Formation.	Locality.
1674–78 incl.	Acervularia	Upper Helderberg	Kelly's island, O.
1679, 80	Favosites Emmonsi and Stromatopora	Cornif. lime.	Charleston, Ind.
1681–89 incl.		Upper Helderberg	Charleston, Ind.
1690–94 incl.	Monticulopora	Hudson River group	Waynesville, Ohio.
1695-1707 incl.	Niagara limestone		Lockport, N. Y.
1708, '9, '10, '11	Michelinia	Upper Helderberg	Leroy, N. Y.
1712	Cyathophyllum rugosum	Upper Helderberg	Clarksville.
1713–29 incl.	Stromatopora	Upper Helderberg	Kelly's island, O.
1730, '31	Favosites hemispherica	Upper Helderberg	Cedarville, N. Y.
1732–38 incl.	Stromatopora	Lower Pentamerus	Cedarville, N. Y.
1739	Favosites Helderbergiæ, Stromatopora and Alveolites		Cedarville, Herkimer Co., N. Y.
1740–72 incl.	Stromatopora	Lower Pentamerus.	Cedarville, Herkimer Co., N. Y.
1773	Callopora	Hamilton group	Eighteen-mile creek, N. Y.
1774	Eridophyllum	Corniferous limestone	Cedarville, N. Y.
1775–78 incl.	Pachyphyllum Woodmani	Chemung group	Hackberry, Iowa.
1779, '80		Hamilton group	Independence, Iowa.
1781	Eozoön Canadense		Thurman, N. Y.
1782, '3, '4	Ophiolyte		Lowell, Mass.
1785–89 incl.	Cyathophyllum rugosum	Upper Held	Clarksville, N. Y.
1790–96 incl.	Stromatopora	Upper Helderberg	Kelly's island, Ohio.
1797-1803 incl.	Stromatopora	Upper Helderberg	Kelly's island, Ohio.
1804–13 incl.	Stromatopora	Hamilton group	Skaneateles lake, N. Y.
1814–17 incl.	Stromatocerium rugosum	Black River group	Lake Champlain.
1818, '19, '20	Stromatopora		
1821–30 incl.	Concretion ?	Hudson River group	Stuyvesant, N. Y.
1831, '2, '3	Favosites	Upper Helderberg	Clarksville, N. Y.
1837–40 incl.	Cryptozoön	Calciferous group	Little Falls, N. Y.
1841, '2, '3	Favosites	Hamilton group	New York.
1834, '5, '6	Alveolites	Hamilton group	Little Traverse bay, L. Mich.
1844, '5, '6, '7	Cryptozoön	Calciferous group	Little Falls, N. Y.
1848	Astræospongia meniscus	Niagara group	Tennessee.
1849–52 incl.	Stromatopora	Coralline limestone	Schoharie, N. Y.
1853	Favosites	Hamilton group	Alden, N. Y.
1854, 1855	Stalagmite (cave)		Thompson's lake, N. Y.
1856–60 incl.	Tennessee marble		(New Capitol).
1861	"Mexican onyx"		(New Capitol).
1862–66 incl.	Niagara limestone		Lockport, N. Y.
1867	Tetradium	Hudson River group	
1868	Sponge	Hudson River group	Kentucky.
1869, 1870	Belemnite		
1871, '2, '3, '4	Stalactite		Ball's cave, N. Y.
1875, '6, '7	Cyathophyllum rugosum	Upper Held	Clarksville, N. Y.
1878	Zaphrentis	Hamilton group	Skaneateles lake.
1879	Heliophyllum	Hamilton group	Darien, N. Y.
1880	Astylospongia inornata	Lower Helderberg	Clarksville, N. Y.
1871, 1882	Chætetes lycoperdon		Middleville, N. Y.
1883–88 incl.	Niagara limestone		Lockport, N. Y.
1889	Favosites Niagarensis	Coralline limestone	Schoharie, N. Y.
1890	Favosites Forbesi	Niagara group	Waldron, Ind.
1891	Astylospongia præmorsa	Niagara group	Waldron, Ind.
1892	Columnaria inequalis	Coralline lime	Schoharie, N. Y.
1893, 1894	Hornstone	Upper Helderberg	
1895, 1896	Eridophyllum	Upper Helderberg	
1897, 1898	Shell limestone	Hudson River group	
1899	Stromatopora		Louisville, Ky.

No.	Name.	Formation.	Locality.
1900	Stromatopora		Sharon, N. Y.
1901, '2, '3, '4	Fossil wood		
1905	Oölite		
1906	Favosites		
1907	Diphyphyllum	Corniferous limestone	
1908	...		
1909, 1910	Stromatopora		Kelly's island.
1911, 1912	Stromatopora expansa	Chemung	Rockford, Iowa.
1913, '14, '15	Stromatopora	Coralline limestone	Schoharie, N. Y.
1916	Callopora ponderosa	Lower Helderberg	Schoharie, N. Y.
1917	Astylospongia inornata	Lower Helderberg	Clarksville, N. Y.
1918	Cænostroma incrustans	Chemung	Rockford, Iowa.
1919, '20, '21	Favosites and Heliophyllum	Hamilton group	West Williams, Ca.
1922, '23	Favosites	Hamilton group	West Williams, Ca.
1924–28 incl.	Strombodes pentagona	Niagara group	Louisville, Ky.
1929–32 incl.	Chætetes	Upper Coal Measures	Jackson Co., Mo.
1933–37 incl.	Stromatocerium	Hudson River group (drift)	Michigan.
1938–41 incl.	Fusulina	Carboniferous	Upper Missouri.
1941–45 incl.	Michelinia	Corniferous	Cherry Valley.
1946–47 incl.	Michelinia	Upper Helderberg	Clarksville, N. Y.
1948–52 incl.	Michelinia Stylopora	Hamilton group	
1953, 1954	Tetradium	Hudson River	
1955–58 incl.	Stromatopora		Bohemia.
1959	Sponge	Hudson River group	Kentucky.
1960–64 incl.	Astræospongia meniscus	Niagara group	Tennessee.
1965, 1966	Niagara limestone		Lockport.
1967–73 incl.	Favosites Niagarensis	Coralline lime	Schoharie, N. Y.
1974	Favosites Niagarensis, Chætetes and Stromatopora	Coralline limestone	Schoharie, N. Y.
1975, 1976	Halysites catenulatus	Niagara group	Port Jervis, N. Y.
1977, 1978	Stromatopora		Sharon Hill, N. Y.
1979	Favosites		
1980	Oölite	Calciferous	Saratoga Co., N. Y.
1981	Favosites Forbesi	Niagara	Waldron, Ind.
1982	Astylospongia inornata	Lower Helderberg	New York.
1983	Clinton iron ore		
1984–88 incl.	Monticulipora	Hudson River group	Cincinnati. O.
1989–91 incl.	Monticulipora fibrosa	Hudson River group	Cincinnati, O.
1992, '93	Monticulipora dalii	Hudson River group	Cincinnati, O.
1994	Monticulipora mammulata	Hudson River group	Cincinnati, O.
1995, '96	Stellipora antheloidia	Hudson River group	Cincinnati, O.
1997	Chætetes		
1998	Stromatopora ?		Port Jervis.
1999, 2000	Eozoön Canadense	Laurentian	Thurman, Warren Co., N. Y.
2001–5 incl.	Ophiolite		Massachusetts.
2006, '7	Oölite	Calciferous group	Saratoga, N. Y.
2008–11 incl.	Alveolites	Chemung group	Rockford, Ia.
2012	Cænostroma incrustans and Alveolites		Rockford, Ia.
2013, '14	Favosites Emmonsi	Upper Helderberg group	Clarke Co., Ind.
2015, '16	Favosites		Iowa.
2017–19 incl.	Acervularia Davidsoni	Hamilton group	Iowa City.
2020, 21	Favosites Niagarensis	Coralline limestone	Schoharie.
2022	Trenton limestone		Flat creek, Montgomery Co., N. Y.
2023	Waterline group (limestone)		
2024	Onondaga salt group (limestone)		
2025	Medina sandstone		
2026	Astræospongia meniscus	Niagara group	Tennessee.
2027, '28	Diphyphyllum		

No.	Name.	Formation.	Locality.
2029, '30, '31	Zaphrentis,	Upper Helderberg group	Clarksville, N. Y.
2032–42 incl.	Favosites Forbesi,	Niagara group	Waldron, Ind.
2043, '4, '5	Crinoid stem		
2046–51 incl.	Stromatopora,	Lower Pentamerus	Clarksville, N. Y.
2052, '3, '4	Favosites Niagarensis,	Coralline limestone	Schoharie, N. Y.
2055	Diphyphyllum and Stromatopora,	Corall. lime.	Port Jervis, N. Y.
2056 '7	Stromatopora,	Coralline limestone	Schoharie, N. Y.
2058–64 incl.		Upper Helderberg limestone.	Clarksville, N. Y.
2065–70 incl.	Favosites,	Upper Helderberg limestone	Cherry Valley, N. Y.
2071	Monticulipora,	Hudson River group	Cincinnati, O.
2072	Chætetes lycoperdon,	Trenton limestone	New York.
2073, '74	Chætetes,	Corniferous limestone	Lexington, Ind.
2075		Lower Helderberg limestone	Hudson, N. Y.
2076, '77	Alveolites,	Hamilton group	W. Williams, Canada.
2078, '79	Diphphyllum,	Upper Helderberg group.	
2080	Cystiphyllum,	Hamilton group	W. New York.
2081–87 incl.	Stromatopora,	Upper Helderberg group	Kelly's island, O.
2088	Favosites venustus,	Niagara group	Lockport, N. Y.
2089	Chætetes, Stromatopora, Favosites Niagarensis,	Coralline limestone	Schoharie, N. Y.
2090, '91	Columnaria,	Hudson River group (Western)	
2092	Cryptozoön,	Calciferous group	Saratoga Co., N. Y.
2093		Medina sandstone	
2094	Beyrichia,	Clinton group	
2095, '6, '7	Stromatopora expansa,	Chemung group	Rockford, Iowa.
2098-2100 incl.	Stromatopora		Iowa.
2101, 2102	Favosites,	Hamilton group	Iowa City, Iowa.
2103-2107 incl.	Favosites,	Hamilton group.	Iowa City, Iowa.
2109, '10, '11	Chætetes,	Upper Coal Measure	Newburgh, Ind.
2112–15 incl.	Halysites,	Niagara group	Iowa.
2116, '17, '18	Beatricia,	Hudson River group	Waynesville, O.
2119, '20, '21	Stromatopora,	Hamilton group	York, N. Y.
2122–27 incl.	Stromatopora and Heliophyllum		York, N. Y.
2128	Chætetes,	Trenton limestone (Geb. Coll.).	

[To this list there are to be added several hundred specimens not yet recorded.]

REPORT

OF THE

STATE ENTOMOLOGIST

TO THE

REGENTS OF THE UNIVERSITY OF THE STATE OF NEW YORK.

For the Year 1883.

REPORT.

To the Honorable Board of Regents of the University of the State of New York:

Gentlemen — Under the provisions of Chapter 377 of the Laws of 1881, providing for the office of State Entomologist, it was required that "the Entomologist shall render an annual report of his labors and investigations to the Legislature."

Under Chapter 355 of the Laws of 1883, regulating the State Museum of Natural History, it is provided that the State Entomologist shall become, by appointment of the trustees of said Museum, a member of its scientific staff; and that his scientific contributions be hereafter published by the Museum, in lieu of the report to the Legislature formerly required by law.

In reply to a communication from your Secretary in May last, inquiring if the appointment above provided for was desired by me, I returned answer as follows:

David Murray, LL. D., *Secretary of Board of Regents:*

Dear Sir — To your kind favor of the 23d inst., I beg leave to reply:

My appointment by the Board of Regents of the University as a member of the scientific staff of the State Museum of Natural History, under the provisions of Chapter 355 of the Laws of 1883, would be entirely agreeable to me, and is desired.

It will give me pleasure to coöperate in earnest effort to extend the usefulness of the State Museum with which I have been so long and pleasantly connected; and also, to prosecute my studies and labors in future, under the guidance and direction of your honorable board, in accordance with my original desire, at the establishment of my present office.

Very truly yours,
J. A. LINTNER.

Albany, *May* 26, 1883.

Under date of June 1, 1883, your Secretary honored me with official notification of my appointment by your board as State Entomologist.

Since that time I have continued to pursue my studies and investigations in the office that had been provided for me in the Capitol.

I beg leave to present the following as a brief synopsis of my subsequent operations:

A long delay in the publication of my first report to the Legislature,* and the length of time that it remained in my hands before its final issue in November last, delayed any advance work. This, with the other duties of my office, have prevented me from having in readiness the annual report embodying my scientific investigations of the past year, which I would have been happy to present to your honorable board at this time. You will, therefore, I trust, excuse its delay which has seemed inevitable, and accept at the present a brief statement of my official labors since the date of my appointment.

CORRESPONDENCE AND EXAMINATIONS.

The correspondence of the office has been large, and, unaided as I am, somewhat burdensome. With the increasing interest felt throughout our country in the causes and means of control of insect injuries, calls for information upon these and kindred points are increasing in frequency. While so few of our States have their entomologists, additional labor devolves upon the few individuals who have been specially set apart for entomological work. The determination of specimens, or the investigation of some obscure form of insect attack requested of me, may require the labor of days before suitable answer can be returned. Such calls, when coming from other and remote States of the Union, would more appropriately be sent to the Entomological Department at Washington, where, through its efficient corps of six assistants to the Entomologist, large provision is made for an amount of work of this character. Still, as scarcely a single study of the kind, coming to me from whatever source it may, can fail of contributing to the efficiency of this department, I have felt myself authorized in giving to them all the attention that their importance has appeared to demand.

The results of these examinations have been, from time to time, communicated by me to leading agricultural and scientific journals, that the information conveyed might not be limited to the individual replied to. Since the first of June, twenty-eight such publications have been made by me. Several of these will be available, after emendation and addition, for presentation in my annual report, or other publication by the State Museum.

COLLECTIONS.

Under the act last above cited, the collections made by the Entomologist are to belong to, and form a part of, the collections of the State Museum. For reasons above stated, my collections during the past season have been quite limited. No excursions for the special purpose of collecting, were made by me. There was not the available time to devote to the immediate preparation for the cabinet which so large a proportion of insects require, of a large amount of material, nor provision for its safe-keeping — much less for its display.

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*First Annual Report | on the | Injurious and other Insects | of the | State of New York | made to the State Legislature, pursuant to chapter 377 of | the Laws of 1881, | by J. A. Lintner, | State Entomologist. | —— | Issued, October, 1883. | —— | Albany: | Weed, Parsons and Company, printers, | 1882. | —— | 8vo., pp. xxii-381, figs. 84.

The total number of specimens collected and mounted is twelve hundred and twenty. They are contained in the several orders as follows:

Hymenoptera	50	Hemiptera	322
Lepidoptera	237	Orthoptera	17
Diptera	152	Neuroptera	25
Coleoptera	372	Biological	45

The number of species cannot at present be named, as much of the material has not yet been studied. A large portion of it will be available for distribution to the educational institutions of the State or for exchange.

In addition to the above, the following collections have been made:

Larvæ of Lepidoptera, etc., in alcohol, approximately	250
Unmounted Coleoptera, Hymenoptera, etc., approximately	350
Unmounted Biological specimens, approximately	500
Pupæ from larvæ collected, hybernating	130

The aggregate number of specimens collected, as appears from the above, is two thousand four hundred and fifty.

The collections have mainly been made in Middleburgh, Schoharie Co., at Elk lake, in Essex Co., in the town of Hammond, St. Lawrence Co., and in Albany.

INSECTS OF SPECIAL INTEREST.

Among those at Middleburgh were a number of *Trypetidæ,* of the group in which the wings are exquisitely marked with clouds and spots in the beautiful patterns which have been so admirably delineated in the four plates of Baron Osten Sacken, and the late Dr. Loew of Prussia, in their valuable monographs of this interesting family. These flies had seldom fallen under my observation before, and then in only single examples; but at this time (middle of July) and place they were not at all uncommon, traveling, with the strange movements peculiar to them, over the leaves of the milkweed (*Asclepias*) and wild parsnip (*Pastinaca sativa*), upon which the species may perhaps breed.

The time of my visit to Elk lake — Aug. 15–30 — was favorable for the collection of two species of butterflies which are rarely met with in this State, except in localities having high elevations, approximating that of Elk lake, which is 2,000 feet above tide. *Grapta Faunus* (Edw.) and *Grapta j-album* (Boisd.-Lec.) were comparatively abundant in the roadway leading to the lake, resting for a while upon the damp soil to imbibe its moisture and then flitting away to the adjoining shrubbery. Both species had evidently but just emerged from their pupal stage. Of another species of butterfly — *Feniseca Tarquinius* (Fabr.), which appears to be quite local in its distribution and to occur more frequently within this State, in the Adirondack region than elsewhere, several examples were captured, but all in indifferent condition, showing that they had already been abroad for a number of days. Its larval food-plant is said by Mr. Glover to be hawthorn (*Cratægus*), but in this and in both previous instances in which the butterfly has been observed by me, it has been associated with alders (*Alnus* species), and where the hawthorn was not seen to occur.

An interesting illustration of the abundance at times and in certain localities of a particular species of insect, conjoined with the absence of other allied and perhaps more common forms, was given me at this locality. With a single exception, in a solitary example of *Catocala unijuga* (Walker), the only noctuid moth observed by me during my fortnight's sojourn here, was *Agrotis clandestina* (Harris). To add to the interest, all the examples had one common hiding-place, viz. : behind and about the sliding window-sashes of the exceedingly simple log structure that bore the euphonious name of the Elk Lake Hotel. The only conceivable attraction of such multitude of moths to their covert was a single kerosene hand-lamp, and later at night for a brief space of time, a candle in each of the four bed-rooms. Their assemblage in such numbers, under such circumstances, was a mystery to me. A sash could not be moved without disturbing a dozen of them. Hundreds could have been captured, but as many were in poor condition and the species is a common one, twenty-five examples only were brought away.

The black-fly, *Simulium molestum*, was abundant, but not very troublesome, for in the month of August it ceases to show the insatiable disposition to gorge itself with blood that it manifests in the preceding months. A number of specimens were captured and bottled for the museum collections as objects of interest to the many who have never recognized this minute yet most annoying pest of our northern wilderness.

Upon some cut poplars (*Populus tremuloides*) piled by the way-side, a large number of a wood-boring beetle, *Agrilus torpidus* (Lec.), which I had never met with before, were observed alighting from their flight in the bright sunshine, and running in jerking motions actively over the bark. Its larva is doubtless a borer in the poplar. Sixty-two examples of it were taken.

A NEW FORM OF INSECT ATTACK.

It would not be proper that at this time I should refer to more than a few of the many interesting insects, their habits and their attacks which have been brought to my notice during the past summer: I may, however, be permitted to mention two of these attacks.

We have long been familiar in Albany, with the ravages of the white-marked tussock-moth, *Orgyia leucostigma* (Sm.-Abb.), which annually, during the months of June and July, has made such formidable depredations upon the horse-chestnuts, elms, and maples bordering our streets, as to cause their foliage to present a most unsightly appearance. In years when the caterpillar which is the author of these injuries, has been unusually abundant, many of the trees, especially of the horse-chestnuts, have been entirely defoliated. It is this insect from which protection is sought by placing bands of cotton-batting loosely about the tree-trunks when the attack is first noticed — an effective preventive only in the event of the tree at the time being wholly free from the pest, but of no utility whatever if the insect be already upon it, either as young larvæ or as egg-clusters attached to the branches. It is this insect also, which deposits its eggs upon its cocoon, to the number of two or three hundred, and covers them with a mass of viscid, white, frothy matter, which, hardening by exposure, subsequently remains for months or until discolored by age, as conspicuous objects when placed, as they often are, upon the trunks of elms and larger trees, readily arresting the eye of the passer-by.

This past summer, contemporaneously with the first appearance of the attack of the caterpillar upon the foliage, the sidewalks, streets and parks where the elm was growing, were seen to be strewed with its green leaves — in many places so thickly as completely to cover the walks or ground. Upon taking them up for examination, they were found to be the tips of the branches, comprising most of the new growth of the season. The portions thus thrown down were about three inches in length and contained from four to ten fresh, uninjured leaves. It was evident that they had not been broken off by an unusually high wind, for each day continued to add to the number and to increase the abundance of the fall. Making critical observation for the discovery, if possible, of so unusual a phenomenon, it was noticed that from above the point at which the twig had been broken, the bark was entirely removed for an extent averaging one-tenth of an inch. The manner of its removal showed it to have been eaten by an insect. From its character, together with the abundant presence of the caterpillar upon the trees at the time, I believed that it was the work of the *Orgyia*. If so, it was of especial interest, as this form of depredation, had never, to my knowledge, been previously observed. To verify the belief, I ascended to a house-top where the branches of a large elm projecting over the roof gave an excellent opportunity for examination. The larvæ were abundant upon the tree; the flat roof was strewn and heaped in corners with the broken-off tips; large numbers of the girdled twigs still held their place on the tree; and by careful search, larvæ were discovered in the act of eating the bark. From what was subsequently learned, the girdling had at this time nearly ceased.

From the above observations, the following explanation of the cause of the girdled and broken-off twigs of the elm may, I think, safely be given. Upon the eating away of the bark by the *Orgyia* caterpillar, the wood on exposure rapidly dried and soon became so brittle that from a moderate swaying of the branches the weight of a half dozen or more of large and succulent leaves would occasion the breaking of the slender twig — often not exceeding in its dried state the diameter of an ordinary pin.

For the occurrence at this time of this novel form of the *Orgyia* attack, I can offer but the following as a plausible explanation. The spring had been remarkably cold, and, as a consequence, the foliage of the trees had been delayed in development quite beyond the ordinary time. The sudden advent of warm weather caused a corresponding sudden start in vegetation followed by a vigorous growth, and the young twigs of the elm would, as the result, be unusually tender. The particular feeding-ground of many of the lepidopterous larvæ is known to be decided upon only after repeated tastings and rejections of such portions of their food-plant as they traverse, and a final acceptance of that most agreeable to them. By a process like this the *Orgyia* larva may have made the discovery, that just at the commencement of the new growth, as the result of the seasonal conditions above mentioned, there was concentrated in the tender bark nutriment far more acceptable to it than that offered in the leaves, upon which alone it had hitherto been accustomed to feed. As the bark hardened with the advancing season it would cease to be acceptable for food.

The interesting query here arises, suggested by the frequency with which new habits in insects are brought to the notice of the entomologist: will the taste for bark newly acquired by the Orgyias of the last year, be conveyed, through heredity, to their descendants, to be continued through future years and displayed to an extent measured by the degree of tenderness of the bark at the period of their appearance?

The falling of the twigs, in the condition as above given, was first observed about the middle of June. Upon my return to Albany, after a fortnight's absence, on the 27th of July, twigs were still falling, but among them was a large proportion in which a new feature was presented. The breaking, instead of being at the base of the girdling, just above the commencement of the new growth, was, in these, at the preceding node, covering the growth of the former year. As a rule, the twigs showed a greater diameter at their decorticated portion, compared with those of the earlier fall. The greater strength thus given them permitted them to remain upon the tree until the death of the preceding internode, which soon followed the arrest of the circulation — its starvation ensuing, it being unprovided with leaves through which a circulation could still be maintained. When dead a slight motion of the branch, or even the weight of the terminal leaves would be sufficient to disconnect it at its lower and weaker node.

About the 1st of August the twigs ceased to fall. I have not made examination to see whether any of those upon which the above attack was made still remain upon the trees.

Nothing of the kind was observed as occurring upon the other principal food-plants of the *Orgyia*, viz.: the horse-chestnut and the maple, nor would it be expected in association with growth and structure so entirely different from that of the elm.

The same phase of attack was noticed by me in Troy, N. Y. I have seen no publication of its presence elsewhere, although the caterpillar was quite abundant in New York and other of our larger cities.

THE ENGLISH SPARROW PROMOTING INSECT INJURY.

In connection with the incidental mention above of the almost annual defoliation of so many of our more valuable shade-trees by the Orgyia caterpillars, it may be of interest to state that there is every reason to believe that we owe the commencement and regular returns of this annoying form of insect depredation to the introduction into our city, about the year 1868, of the English sparrow, *Passer domesticus*, and its subsequent rapid increase and diffusion. The sparrow does not feed upon the insect, but drives away the four species of birds which are specially fitted by structure of bill for removing the skin from our hairy caterpillars previous to swallowing the nicely prepared tid-bit.

THE CHINCH-BUG IN NORTHERN NEW YORK.

Another insect attack, which has claimed my attention during the past season, presents so many interesting features, and threatens to be of so great importance to the agricultural interests of our State, that I beg leave to present to your board a report of my personal observations upon it. That it might be given the immediate publicity which, in view of the approach of winter, seemed so desirable, it was communicated to the Albany *Argus*, and was published in the issue of October 10. It is as follows:

During the last week in September a package of insects was sent to the State Agricultural Society, with the following statement in regard to them, from Mr. M. H. Smith, of Redwood, Jefferson county: "I herewith transmit specimens of (to us) a new and formidable grass-destroying insect, together with portions of grass destroyed by them, and also some of the soil, for the purpose of examination. If the insect is known to you and there is any known way to exterminate it, please inform us at once. The evidence of its destructive work was first discovered in June of 1882 by Mr. H. C. King, of Hammond, St. Lawrence county. At haying-time, about the middle of July, he noticed about three acres of his timothy grass to be apparently prematurely ripened. In the fall he observed that there was no aftergrowth, and that the stubble was as dead as if it had been boiled. Search was made among the dead roots without any discovery. The following spring the field was entirely barren of timothy, but some clover, weeds and thistles occupied the ground where at least one and one-half tons of timothy to the acre, under favorable circumstances, would have been cut. In June of 1883 Mr. King discovered other fields to be affected in the same manner, and instituted a search which has recently resulted in the discovery of myriads of the insect, not in the dead grass, but at the edge of the live grass, where they may be scraped up by handfuls. They have destroyed about fifteen acres for Mr. King and several acres for each of several other farmers of his vicinity. They are causing extreme alarm, and if you can give any relief from this calamity it will be gratefully appreciated. This is an important grazing locality. In addition to the timothy, June grass and wire grass are also destroyed."

The insect identified.—The insects being submitted to me by Secretary Harison, of the State Agricultural Society, I was compelled—although almost distrusting the evidence of my eyes—to recognize them as the notorious chinch-bug of the Southern and Western States. I had never before seen a New York specimen, nor had I knowledge of its occurrence within our limits, other than the record of Dr. Fitch, of his meeting with three individuals during the winter time upon willows. Dr. Harris, the eminent Entomologist of New England, had seen one specimen in Massachusetts. In each instance the occurrence was deemed of such interest that the date of observation was given.

Throughout the Southern or Western States, or more properly those lying within the "wheat-belt region," the chinch-bug is a well-known enemy, from the almost incredible amount of injury which it inflicts, in certain years, upon the grain and corn crops. Probably the aggregate of pecuniary losses which have resulted to the United States from its ravages have considerably exceeded those inflicted by any other of our thousand insect pests. In 1864, its injuries in the State of Illinois to wheat and corn alone were computed at seventy-three millions of dollars. This was a year of unusual excess, but it is not of rare occurrence that a State suffers a loss of from twelve to fifteen millions of dollars in a single year. When the insect abounds, it is so numerous as to cover the ground; it blackens the stalks of the plants upon which it feeds; it fills the air when, at seasons of its mating, it takes wing for flight; it marches to new feeding grounds in solid bodies, upon and over one another; its invading armies sweep over and utterly destroy a wheat or corn field in two or three days; and the nauseous bed-bug odor which they exhale, sickens those who are compelled to breathe it.

Appearance of the insect.— It belongs to the order of Hemiptera, which comprises all of the bugs proper. It is, therefore, without biting jaws, but takes its food by suction through a four-jointed proboscis, which, at rest, is bent beneath the body. Its size seems quite disproportioned to its destructive powers, being but about the one-tenth of an inch long, and one-third of its length broad. Its body is black and slightly hairy under a magnifier. The wing-covers, resting flat upon its back, are white, with a subtriangular black spot in the middle of the outer margin of each, and a few black veins upon their middle. The feet and swollen ends of the four-jointed antennæ are black, while elsewhere the latter and the legs are dull yellow.

Observations upon the attack.— In addition to the information contained in the communication of Mr. Smith above given, I am able to add the following from my personal observations made during the past week (on October 5th and 6th). The cold weather of the past few days (ice was formed upon three nights) has doubtless driven most of the bugs to their winter quarters for hibernation, in crevices, beneath boards, rails, etc., in rubbish heaps, and to many other secure retreats where such insects are accustomed to hide. Yet, upon parting the roots of the timothy, upon the borders of the killed portion, they were found in alarming numbers — in some spots sufficient to cover the ground with their bodies over an area of two or three inches in diameter, having apparently congregated in such places. In one spot, upon the warm sloping side of a dead furrow, they could be seen, in numbers, running like ants, over the ground. Elsewhere, they were concealed among the roots, near to and about the bulbs, upon which they appeared mainly to feed. Their presence in any spot could always be detected by bringing the nose near the ground by the peculiar bed-bug odor above mentioned. This method of detection proved more convenient and infallible than looking for them.

The invasion is more extended than was at first supposed. Nearly all of the farms in the neighborhood of Mr. King have been attacked, either last year or this, and discoveries of attack not before suspected are, upon examination, being made daily. A present range of about eight miles is indicated. It is believed to occur throughout most of the town of Hammond, and to extend into Alexandria.

Just cause for alarm.— Without any desire to play the role of an alarmist, I feel it my duty to say that, as the result of my observations, this chinch-bug invasion of northern New York threatens to be the most serious insect attack to which our State has ever been subjected. The following are my reasons for this belief:

It has planted itself, maintained a footing, and has shown a rapid increase under unfavoring, unpropitious and unnatural conditions, such as these:

First. It is regarded as a southern insect (extending farther northward, as do most animal forms, in the Mississippi valley), yet it has appeared in the most northern county of the State, and upon (if the report be reliable) the St. Lawrence river.

Second. Its attack has been made upon timothy. This seems to be its most unusual food-plant, and, therefore, we infer, the least suited to it. All previous accounts concur in giving it a preference for spring wheat above all things else; next in order, oats or corn, and last the grasses. Timothy is only mentioned as occasionally attacked by it.

Third. In all previous accounts, great prominence has been given to its being a hot and dry weather insect, dependent upon these conditions, not only for its multiplication, but for its existence. Heavy rains have been claimed to be invariably fatal to it. It could not abound, it is stated, in a wet season. Dr. Fitch had even made recommendation of sprinkling it with water (an artificial shower), as the best means for its extermination. In the present instance, the bug obstinately persists in multiplying, contrary to all rule. The past year and the present have both been years of excessive rainfall in St. Lawrence county. Spring, summer and autumn have been exceptionally wet. In the spring, I am told that heavy and continued rains flooded meadows now showing the chinch-bug attack. At haying time, when the bugs were young, and, according to all the statements hitherto made, readily killed by wet, the rains were so frequent and severe, that the grass cut could only be secured with difficulty. Upon Mr. King's farm much of it was drawn in, upon favorable days, by improving the opportunity of extending the labor into hours after nightfall. At the present time grass is lying in fields in stacks, which could not be gathered, owing to continued rain, and fields of oats are still unharvested.

Persistence of the attack.— It is shown, by the above statements, that the insect has rapidly increased and largely extended its area during the present year, under conditions which should have been fatal to it. Why it has been otherwise may perhaps find its explanation in the fact that it is a new introduction into this part of the United States, and that it is following the law well known to prevail in the introduction from abroad (Europe, principally) of nearly all of our injurious insects. With scarcely an exception, with their importation they become far more destructive, causing greater ravages and often attacking new food-plants.

As the past history of the insect has shown that parasites and other enemies have entirely failed to arrest its multiplication, we are compelled to believe, from present indications, that it has come to stay, and that it will do so, unless effectual means are taken to prevent it. Its capability of increase is wonderful. Under the most conservative circumstances, a single chinch-bug, depositing its eggs about the first of June, would be, in the following August, the progenitor of a quarter of a million.

Importance of arresting the attack. — It should not be necessary to urge the importance of doing whatever can be done to arrest this attack, which threatens to be more serious to New York than was that of the wheat-midge, the loss from which, in some years, was computed at $15,000,000. If it should continue to increase it will doubtless extend to wheat and corn and other of the grains. In its southern extension in this State it would naturally become more serious. At the present it is known in but two counties — Jefferson and St. Lawrence. It seems practicable by prompt, earnest and combined effort, to prevent its extension and to check it where it now exists. There is scarcely a doubt that had its presence in the two limited areas in the town of Hammond, last year, been known at the time, it might have been exterminated at a very moderate cost and with little labor. Had an area of about one acre of timothy been thoroughly showered with kerosene (diluted) by means of a street sprinkler or a more simple contrivance, upon the same plan, the attack should have been arrested.

Remedial measures recommended. — Unfortunately, at the present time a large proportion of the attacking insects seem to have left their feeding grounds and to have flown to winter quarters, where they may not be reached. Where they are still to be found among the roots of timothy, about the borders of the destroyed areas, I have recommended an immediate plowing under, by turning over a flat — not overlapping — broad furrow, of the greatest depth practicable, not less than eight inches. The insects could not survive this burial. When the condition of the dead grass will admit of burning, this should be done. A thin covering of straw first applied would aid materially in the burning. As early in the spring as practicable, the meadows should be heavily rolled in order to prevent the easy access of the hibernating bugs to the roots of the grasses for the deposit of their eggs.

Wheat fields should also be rolled for the same purpose, for an attack upon them may be expected the ensuing year. A wheat field of Mr. King seems to have been infested the present year, but to have been checked by its roots having been submerged by a heavy rainfall continued for several days.

The coming spring, as soon as the new attack is discoverable, in the month of June, the sprinkling with kerosene oil should be generally resorted to. The best method for diluting the oil by first making an emulsion of it with soap suds, and the degree to which it should be diluted will be stated hereafter in a more extended publication to be made, which will embrace the natural history of the insect, and other interesting details in relation to it.

ALBANY, *October* 8, 1883.

In consultation with your Secretary, it was thought best, in view of the alarming character of the attack, that general attention should be called to it throughout the infested region, and instructions given as to the best means for arresting it, particularly such as should be at once resorted to, in order to reach as large a portion as possible of the present brood. A circular of this character was accordingly prepared. An edition of three thousand copies was printed, and they have been very generally distributed throughout the portions of the State where the attack had been observed, together with such contiguous territory as it may be expected to reach in another season. The circular is herewith presented;

CIRCULAR NO. 1. — OCTOBER, 1883.

NEW YORK STATE MUSEUM OF NATURAL HISTORY:

DEPARTMENT OF ENTOMOLOGY.

Directions for Arresting the Chinch-bug Invasion of Northern New York.

Portions of St. Lawrence county, New York, are now suffering from a serious attack of the chinch-bug (*Blissus leucopterus*) — perhaps the most injurious of our insect enemies.

It has already, in the third year (probably) of its introduction, and the second year of the observation of its attack, spread to such an extent, and shown such a rapid increase under very unfavorable conditions, that a continued increase in its diffusion and destructiveness is probable, unless effectual measures can be taken to prevent it.

At present, only timothy and other grasses seem to have been attacked. Wherever attacked, the root is destroyed, and the grass, consequently, is entirely killed.

With its increase, its ravages would extend to wheat, rye, barley and corn, which are its favorite food-plants.

Its extension over the State of New York, as now threatened, would be attended with an annual loss of millions of dollars.

It seems practicable, at this stage, to prevent this extension, by earnest and combined effort throughout the district now invaded.

The most favorable time for this effort has already passed; but much may be accomplished by immediate action.

As it is of very great importance that this destructive insect — the terror of our Southern and Western farmers — should not be permitted to obtain a permanent footing in our State, hitherto free from its depredations, a prompt and full compliance with the following directions is strongly urged:

1. Let every farmer in St. Lawrence county and adjacent counties in Northern New York (particularly in the western portion of St. Lawrence and northern of Jefferson), examine his meadows for patches of dead grass, looking as if winter-killed, indicating the attack of the insect. As an aid to its ready recognition, the infested areas upon the

farm of Mr. H. C. King, of the town of Hammond, St. Lawrence county, may be examined.

2. If the attack is detected, burn the dead grass and its surrounding border of fifteen or twenty feet not yet showing attack. This may be effectually done by first applying a covering of straw. A favoring wind is desirable for the purpose.

3. Plow the burned area (better still if the plowing extends beyond this limit and embraces the entire meadow) in broad and deep furrows, turning the sod completely and flatly over, not permitting it to lie in ridges.

4. To insure the more effectual burying of the insects that may be at present feeding upon, or preparing to pass the winter among, the roots of the grasses, harrow the plowed surface slightly, and follow with a heavy rolling.

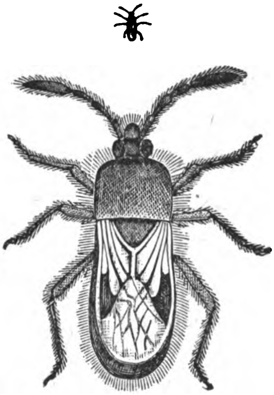
5. Where the meadows will not permit of plowing as above, gas-lime, wherever it can be conveniently obtained from the gas-works at Ogdensburg, Watertown, etc., may be distributed over the ground, at the rate of 200 bushels to the acre. The gas-lime would also serve as a valuable fertilizer.

Of the above directions, the first four should be followed *at once.* The application of gas-lime might be postponed until the month of November, before the setting in of winter, or to the early spring. It should be confined to the dead and infested portions of the meadows, as in its fresh state it would kill the grass. In the winter, during February, it may safely be distributed over the entire fields, where it would probably serve the additional purpose of a preventive of a spring attack.

New attacks and more widespread distribution may be looked for about the first of June in the ensuing year. Directions for meeting these, by other methods, will be given hereafter.

It is hoped that every one interested will cheerfully comply with the above directions, and not render necessary a resort to compulsory legislation, which would undoubtedly call for a large increase of labor and expenditure. The agricultural interests of the State of New York may justly demand that, if possible to prevent it, the chinch-bug shall not be allowed to gain a permanent footing as a grain and grass destroyer within its borders. Its injuries in the State of Illinois, in a single year, were estimated at seventy-three millions of dollars — almost five times the amount computed for the wheat-midge ravages in New York, at the time of its greatest destructiveness.

OFFICE OF THE STATE ENTOMOLOGIST, *October* 18, 1883.



The CHINCH-BUG in natural size and as enlarged (about ten diameters). Color: black, with white wing-covers, having a black subtriangular spot on the outer margin of each, and two black veins nearer the base. The legs, the sucking-tube, and the base of the antennæ, are deep honey-yellow; the feet and the last joints of the antennæ are black. Length, about three-twentieths of an inch.

The young, appearing early in June and late in August, are blood-red, with a white band across their middle; later they change to brown and afterward to black.

I regret to have to report that the response given to the directions of the circular have fallen short of their requirement. Plowing under the infested areas has been quite general, but I do not learn that it has approached the thorough character recommended. Burning has not been resorted to, except upon the farm of Mr. King. The application of gas-lime will probably not be made, to any great extent, as it is reported as not easily to be obtained. Perhaps no other result should have been anticipated at this stage of the attack, or before the absolute necessity of vigorous action should be unmistakably apparent. Former experiences show that our farmers, as a rule, are indisposed to yield ready compliance with recommendations simply, although calculated to save them from serious pecuniary loss, particularly if such recommendations involve any expenditure beyond that of quite a limited amount of extra labor on their part. It would, therefore, seem to be a wise economy for the State whenever a continued extension of any formidable insect attack presents itself, that a prompt resort be had to effectual preventive measures, through legislation compelling the action desired and not otherwise to be had. Several laws for the prevention and destruction of injurious insects exist upon the statute books of European countries. In our own State and others there are laws against noxious weeds; and it would indicate an enlightened progress if there were also those controlling the unlimited spread of some of our more harmful insect pests.

The distribution of the above circular has brought to light the existence of the chinch-bug attack very generally throughout the western angle of St. Lawrence county; its presence on almost every farm in the town of Alexandria in Jefferson county, and elsewhere in other northern towns of the same county; and also upon Deer river in the northern portion of Lewis county.

The re-appearance of the insect the coming season will be watched with much interest, as a test of the efficacy of the partial efforts put forth for its destruction. Although the late autumn and the winter up to the present have been favorable to its continuance, still I hope that the means already resorted to and those hereafter to be taken, will check the further distribution of this most dangerous pest throughout the State, and destroy it where it now exists.

CONCLUSION.

Not further anticipating the details of other insect studies which have engaged my attention during the past season, to be hereafter given in my regular annual report, I would state in conclusion :

The increasing recognition from various sources of the value of the investigations which are being made by this Department, are very gratifying to your Entomologist. They will serve to prompt him to, if possible, more earnest effort in the future, to the end that the great value to the State to the study of the insect world may continue to become more and more apparent until it shall be recognized by all in a cordial sympathy and aid extended to it.

Respectfully submitted,
J. A. LINTNER.

OFFICE OF THE STATE ENTOMOLOGIST,
ALBANY, *January* 8, 1884.

REPORT OF THE BOTANIST,

1883.

REPORT.

To the Honorable the Board of Regents of the University of the State of New York:

Gentlemen — The work of the year now past has been devoted to the poisoning, mounting and labeling of specimens of plants, to their collection, and in some instances to figuring them, in order to preserve as completely as possible the appearance and characters of the fresh growing plant, or to present to the eye at a glance the minute microscopic details and spore characters. Aid has also been rendered to several correspondents by identifying for them specimens of plants sent for that purpose, a work whereby knowledge is disseminated and the advantages of the herbarium are distributed and in a measure rendered available to those even who are not able personally to consult it. Attention has also been given to the examination of diseased specimens of cultivated plants, which have been sent for that purpose, in order that the cause of the affection might, if possible, be ascertained. Some time has also been spent in revising a part of the collection of fungi in the herbarium, the necessity for which is hereinafter set forth.

Specimens of one hundred and forty-nine species of plants have been mounted and added to the herbarium of the State Museum of Natural History, forty-four of which were not previously represented therein. The specimens of the remaining one hundred and five species serve to improve or render more complete the representation of the species or exhibit some form or variety of the plant not previously shown. The mounted specimens include both collected and contributed ones. A list of their specific names accompanies this report and is marked (A). A list of the names of contributors and of the species represented by their respective contributors is marked (B).

The operation of the Executive veto of the appropriation for the expenses of the Botanist in the year 1882 extended over a considerable part of the past year, consequently but little collecting could be done. The appropriation made for this purpose at the last session of the Legislature was not available until October first, the beginning of the present fiscal year, and then the season for field work had nearly closed. But a part of the summer was so favorable to the production of Agarici and other fleshy fungi that I was unwilling to let so good an opportunity pass unimproved. Accordingly I collected what I could in the counties of Albany and Rensselaer without incurring a greater expense than I was able and willing to bear out of my own pocket. The result was the collection of specimens of more than a hundred species of fungi, of which thirty-two are new to our State and several are new to science. The descriptions of the new species are contained in a part of the report marked (C). I have also added to this part of the report descriptions of new species contained in the Thirty-second Report, but which were never published in such a way as to be generally available to the public or to those most interested in having them.

The recent publication of the second volume of Prof. P. A. Saccardo's great work, Sylloge Fungorum, completes that part of the work which pertains to the Pyrenomycetous fungi and gives to mycologists a new system of arrangement and classification of the vast group of Sphæriaceous fungi. While this system recognizes as primary groups or families the Perisporiaceæ, Sphæriaceæ, Hypocreaceæ, Dothideaceæ, Microthyriaceæ, Lophiostomaceæ and Hysteriaceæ, the characteristics of which are based chiefly on external features, after the manner of the old system, it divides these families into sections whose characters are derived from the spores. By a most happy, simple and uniform system of nomenclature the very names of these sections are made to indicate their distinguishing characters and thereby to greatly simplify the system and facilitate the study, identification and classification of the numerous species. Many new genera have been introduced, some of which appear to be founded on rather slight characters, yet as a whole the system so ingeniously combines and employs both the external salient features and the internal spore characters of these fungi that it readily commends itself to favorable consideration. I am not aware that it has more than a single decided opponent, and in my opinion it will be adopted and followed in its general features by nearly if not quite all mycologists. I have, therefore, devoted some time to a revision of our collection of these fungi, that the nomenclature and arrangement of the specimens may keep pace with the advancement of the science and be in harmony with the new order of things thus introduced. This revisionary work is not yet fully completed. The great number of new genera requires the re-examination and re-labeling of many of the specimens. I have prepared a list of the names of our Sphæriaceous fungi, brought down to and including those of the thirty-first report, in which are placed in the left hand column the names as they stand under the new arrangement, in the right hand column the names as given under the former system of arrangement whenever they differ from the others. This list is marked (F).

A record of species new to our flora, but already described, new stations of rare plants, remarks upon new or noticeable varieties, etc., are given in a part of the report marked (D).

In pursuance of a plan devised for the purpose of giving to the public more complete and satisfactory descriptions of certain groups of our fungi than can be found in any works yet published, I have prepared monographs of the three genera, Paxillus, Cantharellus and Craterellus, so far as they are represented in our State. This part of the report is marked (E).

Respectfully submitted,
CHAS. H. PECK,
Botanist.

ALBANY, *December* 31, 1883.

TABLE OF CONTENTS.

A. List of plants mounted.
B. Names of contributors with their respective contributions.
C. Descriptions of new species of New York fungi.
D. Additions other than new species with remarks and observations.
E. Monograph of New York species of fungi belonging to the genera Paxillus, Cantharellus and Craterellus.
F. Names of New York species of Pyrenomycetous fungi according to the Saccardoan system of arrangement.

(A.)

PLANTS MOUNTED.

Not new to the Herbarium.

Ranunculus abortivus, *L.*
Podophyllum peltatum, *L.*
Sarracenia purpurea, *L.*
Sisymbrium officinale, *Scop.*
Alyssum calycinum, *L.*
Draba arabisans, *Mx.*
Ampelopsis quinquefolia, *Mx.*
Tilia Americana, *L.*
Rhus typhina, *L.*
Geranium Robertianum, *L.*
Acer rubrum, *L.*
Lupinus perennis, *L.*
Lespedeza Stuvei, *Nutt.*
Prunus Virginiana, *L.*
P. serotina, *Ehrh.*
Cratægus pyrifolia, *Ait.*
C. coccinea, *L.*
Poterium Canadense, *Gr.*
Potentilla recta, *Willd.*
Rubus villosus, *Ait.*
R. Canadensis, *L.*
R. neglectus, *Pk.*
Pyrus Americana, *D. C.*
Saxifraga aizoides, *L.*
Epilobium molle, *Torr.*
E. palust. v. lineare, *Gr.*
Apium graveolens, *L.*
Lonicera oblongifolia, *Muhl.*
Viburnum Lentago, *L.*
V. Opulus, *L.*
V. dentatum, *L.*
Cornus alternifolia, *L.*
Galium lanceolatum, *Torr.*
Erigeron strigosum, *Muhl.*
Coreopsis discoidea, *T. & G.*
Lobelia Kalmii, *L.*
Vaccinium corymbosum, *L.*
Rhodora Canadensis, *L.*
Cynoglossum officinale, *L.*
Convolvulus arvensis, *L.*
Calystegia sepium, *L.*
Amarantus blitoides, *Wats.*
Rumex Britanica, *L.*
Corema Conradii, *Torr.*
Morus rubra, *L.*
Urtica gracilis, *Ait.*
Carya porcina, *Nutt.*
Quercus macrocarpa, *Mx.*
Q. Muhlenbergii, *Engelm.*
Abies nigra, *Poir.*
Potamogeton pauciflorus. *Pursh.*
Alisma Planta. v. Americanum, *Gr.*
Naias major, *All.*
Sagittaria variabilis, *Engelm.*
Spiranthes Romanzoviana, *Cham.*
Aplectrum hyemale, *Nutt.*
Habenaria hyperborea, *R. Br.*
Trillium erect. v. album, *Pursh.*
Juncus Can. v. coarctatus, *Engelm.*
Scirpus Smithii, *Gr.*
Carex Steudellii, *Kunth.*
C. Houghtonii, *Torr.*
C. tetanica, *Schk.*
C. virescens, *Muhl.*
C. mirabilis, *Dew.*
C. stram. v. festucacea, *Boott.*
C. Hitchcockiana, *Dew*
Panicum dichotomum, *L.*
P. Crus-galli v. hispidum, *Muhl.*
Eragrostis capillaris, *Nees.*
E. poæoides, *Beauv.*
E. Purshii, *Schrad.*
Danthonia spicata, *Beauv.*
Cinna pendula, *Trin.*
Festuca nutans, *Willd.*
Asplenium Bradleyi, *Eaton.*
Aspidium Goldianum, *Hook.*
Botrychium lanceolatum, *Angst.*
B. matricariæfolium, *A. Br.*
Isoetes Engel. v. gracilis, *Engelm.*
Azolla Caroliniana, *Willd.*
Parmelia oliv. v. aspidota, *Ach.*
Agaricus vaginatus, *Bull.*
A. vulgaris, *Pers.*
A. granulosus, *Batsch.*
A. melleus, *Vahl.*
A. arvensis, *Schæff.*
A. petaloides, *Bull.*
A. tener, *Schæff.*
A. fœnisecii, *Pers.*
A. præcox, *Pers.*
A. flavescens, *Pk.*
Hygrophorus borealis, *Pk.*
H. luridus, *B. & C.*
Lactarius distans, *Pk.*
L. pyrogalus, *Bull.*
Cantharellus cibarius, *Fr.*
Russula nitida, *Pers.*
R. flavida, *Frost.*
R. variata, *Banning.*
Polyporus brumalis, *Pers.*
Hydnum zonatum, *Batsch.*
H. graveolens, *Delast.*
Phallus impudicus, *L.*
Gnomoniella fimbriata, *Sacc.*

New to the Herbarium.

Sisymbrium canescens, *Nutt.*
Lonicera Xylosteum, *L.*
Scabiosa australis, *Wulf.*
Hieracium Pilosella, *L.*
Calamintha acinos, *Clœrx.*
Atriplex hortensis, *L.*
Carex hirta, *L.*
C. flaccosperma, *Dew.*
Phalaris Canariensis, *L.*
Asplenium ebenoides, *Scott.*
Agaricus pantherinus, *D. C.*
A. infantilis, *Pk.*
A. phyllophilus, *Fr.*
A. pithyophilus, *Secr.*
A. basidiosus, *Pk.*
A. alcalinolens, *Pk.*
A. aquosus, *Bull.*
A. clavicularis, *Fr.*
A. albinellus, *Pk.*
A. Rodmani, *Pk.*
A. fuscofolius, *Pk.*
A. castanellus, *Pk.*
Agaricus bullaceus, *Bull.*
Paxillus simulans, *Pk.*
Lactarius albidus, *Pk.*
L. cilicioides, *Fr.*
L. lividus, *Pk.*
L. deceptivus, *Pk.*
Russula albida, *Pk.*
R. uncialis, *Pk.*
Cortinarius simulans, *Pk.*
C. cinnabarinus, *Fr.*
C. gracilis, *Pk.*
C. praepallens, *Pk.*
Hygrophorus virgineus, *Fr.*
H. minutulus, *Pk.*
Hydnum albidum, *Pk.*
H. rufogriseum, *Pk.*
H. hirsutum, *Pk.*
H. scrobiculatum, *Fr.*
Melanogaster Americanus, *Pk.*
Valsa sepincola, *Fckl.*
Cryptospora Betulæ, *Tul.*

(B.)

Contributors and their Contributions.

Mrs. S. M. Rust, Syracuse, N. Y.

Atriplex hortensis, *L.*

Mrs. I. B. Sampson, Albany, N. Y.

Stellaria pubera, *Mx.*
Rhodora Canadensis, *L.*

Mrs. C. M. Ferry, Oneida, N. Y.

Agaricus trullisatus, *Ellis.*
Lenzites betulina, *Fr.*
Geaster hygrometricus, *Pers.*

F. W. Battershall, Clyde, N. Y.

Geranium Robertianum, *L.*

Prof. W. G. Farlow, Cambridge, Mass.

Puccinia obscura, *Schrœt.*
P. Lantanæ, *Farl.*
Isariopsis pusilla, *Fres.*
Peronospora Linariæ, *Fckl.*
Microstroma leucosporum, *Niessl.*
Cercospora Pyri, *Farl.*
C. leptosperma, *Pk.*
Entyloma Lobeliæ, *Farl.*
E. Compositarum, *Farl.*
E. Menispermi, *F. & T.*

A. B. Seymour, Cambridge, Mass.

Æcidium Hibisciatum, *Schw.*
Æ. Orobi, *Pers.*
Æ. Amorphæ, *Cke.*
Uromyces pyriformis, *Cke.*
U. Sparganii, *C. & P.*
U. Junci, *Schw.*
Microsphæra elevata, *Burrill.*
M. erineophila, *Peck.*
Puccinia Tanaceti, *D. C.*
P. Gentianæ, *Strauss.*
P. Amorphæ, *Curt.*
P. Hyssopi, *Schw.*
P. lateripes, *B. & K.*
P. Kuhniæ, *Schw.*
P. Silphii, *Schw.*
P. Aletridis, *B. & C.*

Prof. Wm. Trelease, Madison, Wis.

Oidium irregulare, *Pk.*

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Date Due

~~AUG 1970~~

~~MAR 1972~~

~~MAR 1973~~